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Correction Slip.

The issue of the *Tropical Agriculturist* for the 1st Quarter, 1945, *i.e.*, January to March, should be numbered VOL. CI. No. 1, and not VOL. CI. No. 4 as appearing on the outer cover.

The

Tropical Agriculturist

JANUARY TO MARCH, 1945.

EDITORIAL

EMERGENCY AGRICULTURE

THE article on the control of pests by cultural methods comes none too soon in these difficult times, for it provides a very necessary reminder that farming systems and farming practices that have been established in a country should not be lightly altered. An accepted and traditional agricultural practice represents the result of several generations of experience, in the course of which several other practices, which seem apriori to be perfectly simple and feasible, have been tried and rejected and then deservedly forgotten. In other words, such a practice must be regarded as having been reached after prolonged trials extending over several centuries in the course of which the log books have been lost and only the final conclusion is remembered.

The shortage of rice in the Island and the desperate measures that had to be taken to bridge the gap between the consumers' requirements and the producers' meagre yields have apparently been responsible for a defence regulation under which every paddy field has to be cultivated twice a year on pain of the field being requisitioned. It looks very much as if this piece of legislation represents a revival of one of these forgotten failures. The measure seems so obviously right and logical that no public administrator who rightly or wrongly prides himself in being practical and level-headed, can easily be dissuaded from enforcing it. The reasoning seems unanswerable—if a work unit is operated twice as long, naturally the output will be twice as great. Unfortunately, however, the practice of agriculture does not adapt itself readily to the rules of arithmetic. To those who are conscious of the succession of failures and disappointments that stretch endlessly behind a perfected farming system, the first thought would have been, " This seems so correct *prima facie* that I wonder whether it has not been tried before and discarded ? "

The question is, of course, not a problem in proportion but a problem in dynamic equilibrium. Indeed, so many factors known and unknown, go to produce this biological balance that if any one of them gets altered, the established balance will be disturbed and it will be difficult to predict what the new balance will be.

Take, for instance, the question of labour—a circumstance which one may think is only remotely connected with the problems of biology. If the same set of labourers are told to cultivate twice the extent of paddy

that they ordinarily cultivate, they can achieve this only by working longer hours during the same number of days, or, if this is not possible, by extending the number of days during which they work. In this country, circumstances compelled the cultivators to prolong their seasons of cultivation to such an extent that sometimes the harvest time of the earlier season ran into the cultivation time of the second. The results were unfortunate in many ways. It suffices to mention here that the paddy plants provided its pests with greater opportunities of multiplication.

The above remarks are borne out by the numerous applications for assistance from field-owners suffering through pest outbreaks. Serious leaf-hopper attack, for instance, has been reported from the Kirindi-oya and Walawe areas; the stem-borer has committed severe depredations in certain areas of the Western Province.

More paddy does not necessarily mean more food for man alone; it can mean more food for pests also with possibly a greater stimulating effect on their fecundity. Unless the conditions are exactly repeated, cultivating a paddy land twice a year will not necessarily give twice the yield as is obtained by cultivating the same paddy land once. Pest control is only one of the factors that have to be closely attended to, if one wishes to alter an existing farming practice appreciably.

ORIGINAL ARTICLES.

STUDIES IN CASSAVA

I. A CLASSIFICATION OF RACES OCCURRING IN CEYLON (Continued)

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AND

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MU. 21
(Sinyokka)

Petiole : 38±1·0 cm. long, carmine (colour deepest at the ends), alternately inclining and horizontal ; distal end curved.

Young Leaf : Purplish green ; midrib red.

Mature leaf : Light green, of medium size, with commonly 7 leaflets ; leaflets somewhat divergent, slightly concave above, with distal halves bending down ; central leaflets 18±0·5 cm. long and 4±0·1 cm. wide.

Petiole scar : Bright purple.

Stem : Yellowish green with pink shading when young ; wood brown when mature.

Flowers : Males early and plentiful ; females late and few ; male calyx pale green with alizarine pink shadng ; stigma white ; ovary green with pink ridges.

Capsule : Apple green to light green with pink wings ; nectary buff.

Tuber : Fat, of medium length ; surface scaly, carrot red to salmon, with occasional grey patches ; phelloderm pink ; flesh white.

Habit : Branching high ; foliage dense.

Distribution : Matale.

MU. 22
(Kalu-ala sinyokka)

Petiole : 33±0·4 cm. long, dark carmine at the ends, less deeply coloured towards the centre alternately inclining and horizontal ; distal end slightly curved.

Young leaf : Light green tinged with purple ; midrib red to green.

Mature leaf : Yellowish green, of medium size, with commonly 7 plane, broad leaflets ; central leaflet 22±0·7 cm. long and 5±0·1 cm. wide.

Petiole scar : Maroon.

Stem : Yellowish green with red stripes when young ; wood brown to silver grey when mature.

Flowers : Males and females abound and bloom almost simultaneously ; male and female calyx neva green with alizarine pink shading ; stigma white ; ovary green with pink ridges.

Capsule : Antique green with pink wings ; nectary coral red.

Tuber : Fat, of medium length ; surface scaly, kaiser brown to Hay's russet ; phelloderm alizarine pink ; flesh white.

Habit : Branching high and infrequent ; foliage sparse.

Distribution : Bibile.

Footnote—The first part of this Article appeared in the Tropical Agriculturist, Vol. C. No. 4 October-December, 1944.

Delay in the preparation of the coloured plates has prevented their inclusion in this number. They will appear in a later issue.

MU. 23

(Sinyokka)

Petiole : 30±0·8 cm. long, bright carmine at the ends, fading to yellowish brown towards the middle, alternately inclining and horizontal, with curved distal end.

Young leaf : Light purplish green ; midrib red.

Mature leaf : Light green, of medium size, with commonly 7 leaflets ; leaflets plane, divergent, bending down ; central leaflet 19±0·6 cm. long and 4±0·1 cm. wide.

Petiole scar : Bright purple.

Stem : Zigzag, yellowish green with red stripes when young ; wood brown to silver grey when mature.

Flowers : Males and females abound and bloom almost simultaneously ; male and female calyx cream with alizarine pink shading ; stigma cream; ovary green with purple ridges.

Capsule : Pale yellowish green with pink wings ; nectary coral red.

Tuber : Long, of medium thickness ; surface rough, salmon with occasional grey patches ; phelloderm Venetian pink ; flesh white.

Habit : Branching high and infrequent ; foliage dense.

Distribution : Nawalapitiya, Ampitiya.

MU. 24

(Sinyokka)

Petiole : 31±0·7 cm. long, dark red at the ends fading to greenish brown towards the middle, faintly sigmoid, horizontal and inclining.

Young leaf : Green with very faint tinge of purple ; midrib red.

Mature leaf : Yellowish green, large, with commonly 7 leaflets ; leaflets divergent, stiff, adaxially concave in cross section ; central leaflet 20±0·7 cm. long and 5±0·1 cm. wide.

Petiole scar : Greenish purple.

Stem : Dark green with red stripes when young ; silver grey when mature.

Flowers : Males and females bloom in profusion and almost simultaneously ; male and female calyx pale green with alizarine pink shading ; stigma white ; ovary green with pink-tipped ridges.

Capsule : Antique green with green wings ; nectary pale orange.

Tuber : Long, of medium thickness ; surface smooth, apricot buff to salmon with occasional grey patches ; phelloderm sea-shell pink ; flesh white.

Habit : Branching variable ; foliage sparse.

Distribution : Kegalla.

MU. 25

(Thunmas-Sinyokka)

Petiole : 36±0·4 cm. long, carmine (colour deepest at the ends), faintly sigmoid, alternately inclining and horizontal.

Young leaf : Light purplish green ; midrib red.

Mature leaf : Dark green, of medium size, with commonly 7 leaflets ; leaflets divergent, bending down, adaxially concave in cross section ; central leaflet 25±0·6 cm. long and 5±0·1 cm. wide.

Petiole scar : Dark purple.

Stem : Bright green with red stripes when young ; silver grey when mature.

Flowers : Males few and late ; female calyx cream with alizarine pink shading ; stigma pale pinkish white ; ovary light green with pink ridges.

Capsule : Apple green to light green with pink wings ; nectary light coral red.

Tuber : Long, of medium thickness ; surface rough, light salmon with occasional pink and grey patches ; phelloderm Venetian pink ; flesh white.

Habit : Branching absent, or high and infrequent ; foliage of moderate density.

Distribution : Kotugoda.

MU. 26

(Rata-sinyokka)

Petiole : 31±0·4 cm. long, carmine (colour deepest at the ends), sigmoid, alternately inclining and horizontal.

Young leaf : Green very faintly tinged with purple ; midrib red.

Mature leaf : Dark green, of medium size, with commonly 7 leaflets ; leaflets somewhat divergent, bending down and tending to be adaxially concave in cross section ; central leaflet $23 \pm 0 \cdot 5$ cm. long and $5 \pm 0 \cdot 2$ cm. wide.

Petiole scar : Dark purple.

Stem : Bright green with shaded red stripes when young, wood brown to silver grey when mature.

Flowers : Males and females abound and bloom almost simultaneously ; male calyx cream with alizarine pink shading ; female calyx cream with alizarine pink lines ; stigma white ; ovary green with pink-tipped ridges.

Capsule : Apple green to light green with pink wings ; nectary coral red.

Tuber : Fat and long ; surface rough, tawny brown to warm buff with occasional grey and pink patches ; phelloderm sea-shell pink ; flesh white.

Habit : Branching variable ; foliage dense.

Distribution : Kegalla.

MU. 27

(Nuga-ala-sinyokka)

Petiole : $30 \pm 0 \cdot 5$ cm. long, dark red at the ends fading to yellowish red towards middle, faintly sigmoid to irregularly shaped, inclining, horizontal and declining.

Young leaf : Light purplish green ; midrib red to green.

Mature leaf : Bright green, large, with commonly 7 leaflets ; leaflets bending down, tending to be adaxially concave in cross section ; central leaflet $19 \pm 0 \cdot 4$ cm. long and $5 \pm 0 \cdot 1$ cm. wide.

Petiole scar : Maroon.

Stem : Light green with shaded red stripes when young, wood brown to silver grey when mature.

Flowers : Males and females abound and bloom almost simultaneously ; male calyx light green with light purple lines ; stigma white ; ovary purplish green with pink-tipped ridges.

Capsule : Antique green to bright green with pink-edged wings ; nectary pale orange yellow.

Tuber : Fat and long ; surface scaly, kaiser brown to Hay's russet ; phelloderm Venetian pink ; flesh white.

Habit : Branching high and infrequent ; foliage sparse.

Distribution : Katugastota and Bibile.

MU. 28

(Sinyokka)

Petiole : $36 \pm 0 \cdot 6$ cm. long, carmine (colour deepest at the ends), faintly sigmoid, alternately horizontal and inclining.

Young leaf : Light purple tinged with green ; midrib red.

Mature leaf : Dark green, large, with 7–9 (commonly 7) leaflets ; leaflets lying close together, bending down, adaxially concave in cross section ; central leaflet $20 \pm 0 \cdot 4$ cm. long and $5 \pm 0 \cdot 1$ cm. wide.

Petiole scar : Dark purple.

Stem : Yellowish green with red stripes when young, wood brown when mature.

Flowers : Males numerous and early ; females few and late ; female calyx cream with alizarine pink shading ; stigma light pink ; ovary purplish green.

Capsule : Apple green to light green with pink wings ; nectary coral red.

Tuber : Fat and long ; surface, scaly, apricot buff to salmon buff ; phelloderm sea-shell pink ; flesh yellowish white.

Habit : Branching variable ; foliage of moderate density.

Distribution : Udispattu.

MU. 29

(Sinyokka)

Petiole : $37 \pm 0 \cdot 8$ cm. long, carmine at the ends, carmine to greenish brown towards the middle ; alternately inclining and horizontal, with distal end curved.

Young leaf : Green tinged with purple ; midrib pale red.

Mature leaf : Light green, of medium size, with commonly 7 leaflets ; leaflets plane, somewhat divergent, bending down ; central leaflet $19 \pm 0 \cdot 4$ cm. long and $5 \pm 0 \cdot 1$ cm. wide.

Petiole scar : Maroon.

Stem : Dark green with shaded dark red stripes when young, wood brown when mature.

Flowers : Males numerous and early ; females few and late ; female calyx light yellowish green with light pink lines ; stigma white ; ovary green with pink ridges.

Capsule : Antique green with pink-edged wings ; nectary coral red.

Tuber : Fat and short ; surface scaly, salmon with occasional pink and grey patches ; phelloderm Venetian pink ; flesh yellowish white.

Habit : Branching low ; foliage dense.

Distribution : Horana.

MU. 30

(Kahamanyokka)

Petiole : 34±0·5 cm. long carmine (colour deepest at the ends), commonly inclining occasionally horizontal, with distal end curved.

Young leaf : Purple ; midrib pale green to yellowish green.

Mature leaf : Yellowish green, medium to small, with commonly 7 leaflets ; leaflets divergent ; bending down at tips ; central leaflet 18±0·4 cm. long and 5±0·1 cm. wide.

Petiole scar : Bright green tinged with maroon.

Stem : Dark green when young, wood brown when mature.

Flowers : Males few and late ; females more numerous and early ; female calyx neva green with faint alizarine pink lines ; stigma white ; ovary green with pink-tipped ridges.

Capsule : Antique green with pink-edged wings ; nectary coral red.

Tuber : Fat, of medium length ; surface scaly, kaiser brown to Hay's russet ; phelloderm light yellow ; flesh yellowish white.

Habit : Branching variable ; foliage dense.

Distribution : Nawalapitiya.

MU. 31

(Sinyokka)

Petiole : 36±0·6 cm. long yellowish-green, ox-blood red at the ends, faintly sigmoid, inclining.

Young leaf : Light purplish green ; midrib red to light green.

Mature leaf : Dark green, of medium size, with usually 7 leaflets ; leaflets flat, moderately divergent, bending down at the tips ; central leaflet 23±0·6 cm. long and 5±6·1 cm. wide.

Petiole scar : Maroon.

Stem : Bright green when young, silver grey when mature.

Flowers : Both sexes abound and bloom almost simultaneously ; calyx of males and females neva green with alizarine pink shading ; stigma white ; ovary green with pink ridges.

Capsule : Antique green to light green with pink wings ; nectary coral red.

Tuber : Fat, of medium length ; surface rough to scaly ; phelloderm light yellow ; flesh yellowish white.

Habit : Branching high and infrequent ; foliage dense.

Distribution : Maho.

MU. 32

(Kalu-sinyokka)

Petiole : 32±0·9 cm. long, blackish red becoming brownish near the centre (colour deepest at the ends), alternately inclining and horizontal ; distal end curved.

Young leaf : Blackish purple-green ; midrib red.

Mature leaf : Dark green, of medium size, with usually 7 leaflets ; leaflets flat, divergent, bending down ; central leaflet 21±0·6 cm. long and 4·5±0·1 cm. wide.

Petiole scar : Yellowish green.

Stem : Dark brownish green with blackish red shading when young, wood-brown when mature.

Flowers : Both sexes abound and bloom almost simultaneously ; calyx of males and females neva green with alizarine pink shading ; stigma white ; ovary green with pink ridges.

Capsule : Antique green to bright green with pink wings ; nectary carmine.

Tuber : Fat, of medium length ; surface rough, tawny brown to warm buff ; phelloderm light yellow ; flesh yellowish white.

Habit : Branching low and frequent ; foliage of moderate density.

Distribution : Puttalam.

MU. 33

(Nuga-sinyokka)

Petiole : 33±0.9 cm. long, blackish red (colour deepest at the ends), slightly sigmoid, inclining and horizontal.

Young leaf : Purplish green ; midrib red.

Mature leaf : Dark green, of medium size, with usually 7 leaflets ; leaflets moderately divergent, adaxially concave in cross section with distal halves bending down ; central leaflet 18±0·5 cm. long and 4±0·1 cm. wide.

Petiole scar : Dark purple.

Stem : Green with shaded red stripes when young ; wood brown when mature.

Flowers : Appear in profusion, and at about the same time in both sexes ; calyx of males pale green with alizarine pink shading ; calyx of females green with Bordeaux shading ; stigma light pink ; ovary green with pink ridges.

Capsule : Antique green to bright green with green wings ; nectary coral red.

Tuber : Of medium thickness, long ; surface slightly scaly, tawny brown to warm buff ; phelloderm light yellow ; flesh yellowish white.

Habit : Branching high and infrequent ; foliage dense.

Distribution : Alawwa.

MU. 34

(Kiri-sinyokka)

Petiole : 34±0·8 cm. long, carmine (colour deepest at the ends), faintly sigmoid, alternately inclining and horizontal.

Young leaf : Purplish green ; midrib red.

Mature leaf : Yellowish green, of medium size, with usually 7 leaflets ; leaflets moderately divergent, adaxially concave in cross section bending down at the tips ; central leaflet 20±0·3 cm. long and 5±0·2 cm. wide.

Petiole scar : Maroon.

Stem : Bright green with shaded red stripes when young, silver grey when mature.

Flowers : Profuse ; males and females bloom almost simultaneously ; calyx of males pale yellow-green with alizarine pink lines ; calyx of females neva green with faint alizarine pink lines ; stigma white ; ovary green with pink ridges.

Capsule : Green to pale yellowish green with pink wings ; nectary pale orange yellow.

Tuber : Fat, of medium length ; surface somewhat scaly, tawny brown to warm buff ; phelloderm yellow ; flesh yellowish white.

Habit : Height of branching variable ; foliage moderately dense.

Distribution : Ambalantota.

MU. 35

Thunmas-Sinyokka.

Petiole : 33±0·7 cm. long, carmine (colour deepest at the ends), straight, inclining.

Young leaf : Light purple tinged with green ; midrib light red.

Mature leaf : Dark green, of medium size, with usually 7 leaflets ; leaflets plane, divergent, bending down ; central leaflet 23±0·7 cm. long and 4·8±0·1 cm. wide.

Petiole scar : Dark purple.

Stem : Zigzag, yellowish green with red stripes when young ; wood brown when mature.

Flowers : Males more numerous ; flowers of both sexes bloom almost simultaneously ; calyx of males cream with faint pink shading at the base ; calyx of females cream with light pink stripes ; stigma pale pinkish white ; ovary green with pink ridges.

Capsule : Apple green to light green with light pink wings ; nectary geranium pink.

Tuber : Of medium thickness and length ; surface rough, warm buff to light buff with occasional grey patches ; phelloderm white ; flesh yellow.

Habit : Branching high and infrequent ; foliage moderately dense.

Distribution : Horana.

MU. 36

(Kalutara-sinyokka)

Petiole : 32±1·1 cm. long, carmine (colour deepest at the ends), inclining, curved at the distal end.

Young leaf : Purplish green ; midrib red.

Mature leaf : Light green, of medium size, with usually 7 leaflets ; leaflets flat, somewhat divergent, bending down ; central leaflet 17±0·5 cm. long and 4±0·2 cm. wide.

Petiole scar : Maroon.

Stem : Dark green with shaded, dark red stripes when young, silver grey when mature.

Flowers : Males and females abound, and bloom similtaneously ; calyx of males yellowish green with alizarine pink shading; calyx of females pale yellowish green with faint, alizarine pink lines ; stigma white ; ovary green with pink wings.

Capsule : Apple green to light green with pink wings ; nectary carmine.

Tuber : Fat and short ; surface rough, tawny brown to hazel brown with occasional grey patches ; phelloderm white ; flesh white.

Habit : Branching high and infrequent ; foliage sparse.

Distribution : Ambalantota.

MU. 37

(Demas-sinyokka)

Petiole : 34±0·9 cm. long, blackish red (colour deepest at the ends), commonly inclining, occasionally horizontal, curved at the distal end.

Young leaf : Light purplish green ; midrib red.

Mature leaf : Dark green, of medium size, with commonly 7 leaflets ; leaflets adaxially concave in cross section, divergent, with distal halves bending down ; central leaflet 18±0·5 cm. long and 5±0·1 cm. wide.

Petiole scar : Maroon.

Stem : Bright green with shaded red stripes when young, silver grey when mature.

Flowers : Males and females bloom almost simultaneously ; calyx of males bright green with Vandyke red shading ; calyx of females light green with Vandyke red shading and stripes ; stigma cream ; ovary green with pink wings.

Capsule : Apple green to light green with bright pink wings; nectary light coral red.

Tuber : Of medium size ; surface somewhat scaly, apricot buff to salmon buff with occasional grey patches ; phelloderm white ; flesh light yellow.

Habit : Branching high, low or variable ; foliage dense ; occasionally aberrant, early-flowering branches with small, trifid leaves appear.

Distribution : Matugama.

MU. 38

(Neti-ratu-manyokka)

Petiole : 34±0·8 cm. long, carmine (colour deepest at the ends), inclining, curved at the distal end.

Young leaf : Light purplish green ; midrib red.

Mature leaf : Dark green, large, with commonly 7 leaflets ; leaflets plane, with distal halves bending down ; central leaflet 21±0·3 cm. long and 4±0·1 cm. wide.

Petiole scar : Dark purple.

Stem : Yellowish green with shaded red stripes when young, wood-brown to silver-grey when mature.

Flowers : Males scarce, dimunitive and abortive ; calyx of females cream with pink lines ; stigma cream ; ovary green with pink ridges.

Capsule : Apple green to light green ; nectary coral red.

Tuber : Of medium size ; surface salmon buff to dirty white, with occasional pink and grey patches ; phelloderm light yellow ; flesh light yellow.

Habit : Branching infrequent ; foliage moderately dense.

Distribution : Horana.

MU. 39

(Kaha-manyokka)

Petiole : 35±0·6 cm. long, light green, inclining, slightly curved at the distal end.

Young leaf : Light purplish green ; midrib yellowish green.

Mature leaf : Dark green, of medium size, with usually 7 leaflets ; leaflets adaxially concave in cross section, bending down at the tips ; central leaflet 22±0·2 cm. long and 5±0·1 cm. wide.

Petiole scar : Bright green.

Stem : Bright green when young, wood brown when mature.

Flowers : Males few and late ; females more numerous and early ; calyx of males and females yellowish green ; stigma white ; ovary light green.

Capsule : Antique green with light green wings ; nectary carmine.

Tuber : Fat and short ; surface rough, liver brown to kaiser brown ; phelloderm light yellow ; flesh yellow.

Habit : Height of branching variable ; foliage dense.

Distribution : Dambulla.

MU. 40

(Kalu-sinyokka)

Petiole : 31±0·5 cm. long, carmine (colour deepest at the ends), inclining ; distal end slightly curved.

Young leaf : Light purple tinged with green ; midrib red.

Mature leaf : Dark green, of medium size, with usually 7 leaflets ; leaflets moderately divergent, adaxially concave in cross section, with distal halves bending down ; central leaflet 17±0·4 cm. long and 4±0·1 cm. wide.

Petiole scar : Maroon with bright green base.

Stem : Dark green with shaded red stripes when young ; wood brown when mature.

Flowers : Both sexes bloom simultaneously ; calyx of males pale yellowish green ; calyx of females pale yellowish green with faint pink lines ; ovary green with pink ridges.

Capsule : Apple green to light green with pink wings ; nectary coral red.

Tuber : Fat, of medium length ; surface rough, apricot buff to salmon ; phelloderm light yellow ; flesh yellow.

Habit : Branching low and frequent ; foliage dense.

Distribution : Akuressa.

MU. 41

(Sinyokka)

Petiole : 48±0·7 cm. long, red (colour deepest at the ends), slightly sigmoid, inclining, horizontal and declining.

Young leaf : Light green ; midrib red.

Mature leaf : Dark green, large, with commonly 9 leaflets ; leaflets broad, not divergent, with distal halves bending down ; central leaflet 24±0·05 cm. long and 7±0·1 cm. wide.

Petiole scar : Dark purple.

Stem : Yellowish green with red stripes when young, silver grey when mature.

Flowers : Males and females appear in profusion and almost simultaneously ; calyx of males cream with alizarine pink shading ; calyx of females alizarine pink internally and cream externally ; stigma pale pinkish white ; ovary green with pink ridges.

Capsule : Apple green to light green with bright pink wings ; nectary geranium pink.

Tuber : Fat and long ; surface rough, warm buff to dirty white with occasional pink and grey patches ; phelloderm white ; flesh white.

Habit : Commonly unbranched ; occasionally throws out aberrant, early-flowering branches with trifid leaves ; foliage dense.

Distribution : Badulla.

MU. 42

(Pura-miyore)

Petiole : 26±0·9 cm. long, yellowish green shaded dark rose at the ends, slightly sigmoid, inclining, horizontal and declining.

Young leaf : Bright green ; midrib red.

Mature leaf : Dark green, of medium size, with commonly 7 leaflets ; leaflets adaxially concave in cross section, divergent, bending down at the tips ; central leaflet 19±0·6 cm. long and 6±0·2 cm. wide.

Petiole scar : Light purple.

Stem : Yellowish green with faint shaded stripes when young ; wood brown when mature.

Flowers : Males few and abortive ; females more numerous ; calyx of females cream ; stigma white, ovary green.

Capsule : Apple green to light green ; nectary coral red.

Tuber : Slim and long ; surface scaly, kaiser brown to russet brown ; phelloderm white ; flesh white.

Habit : Branching absent or late ; foliage dense.

Distribution : Kalmunai.

MU. 43

(Rata-ala-manyokka)

Petiole : 31±0·7 cm. long, yellowish green shaded rose at the base, inclining, horizontal and declining, curved at the distal end.

Young leaf : Bright green ; midrib yellowish green.

Mature leaf : Dark green, large, with commonly 7 leaflets ; leaflets plane, broad, bending down slightly at the tips ; central leaflet 20±0·45 cm. long and 5±0·1 cm. wide.

Petiole scar : Light purple.

Stem : Bright yellowish green when young, wood brown when mature.

Flowers : Males very rare and abortive ; females very much more numerous ; calyx of females pale green to cream ; stigma white ; ovary light green.

Capsule : Apple green ; nectary pale orange.

Tuber : Of medium size ; surface scaly, kaiser brown to apricot buff ; phelloderm pale pink ; flesh white.

Habit : Branching high and infrequent ; foliage dense.

Distribution : Bibile.

MU. 44

(Seeni-miyore)

Petiole : 30±0·6 cm. long, bright carmine, sigmoid, commonly horizontal.

Young leaf : Light green ; midrib red.

Mature leaf : Bright green, of medium size, with commonly 7 leaflets ; central leaflet 19·5±0·4 cm. long and 5±0·1 cm. wide.

Petiole scar : Pomegranate purple.

Stem : Bright green when young, silver grey when mature.

Flowers : Males and females appear in profusion and almost simultaneously ; calyx of males cream with alizarine pink shading ; calyx of females cream with alizarine pink lines ; stigma white ; ovary yellowish green with pink ridges.

Capsule : Antique green to light green with purple-edged wings ; nectary carmine.

Tuber : Of medium size ; surface slightly scaly, apricot to salmon buff ; phelloderm Venetian pink ; flesh white.

Habit : Branching high and infrequent ; produces aberrant, early-flowering branches with trifid leaves ; foliage moderately dense.

Distribution : Kalmunai.

MU. 45

(Kiri-manyokka)

Petiole : 33±1·0 cm. long, carmine at distal end fading downwards to yellowish green, commonly horizontal and declining, occasionally inclining, curved at distal end.

Young leaf : Light green ; midrib red.

Mature leaf : Dark green, large with 7–9 leaflets ; leaflets lie close together and droop ; central leaflet 20±0·7 cm. long and 5±0·1 cm. wide.

Petiole scar : Brownish red tinged green.

Stem : Bright green when young, wood brown when mature.

Flowers : Males and females appear in profusion and almost simultaneously ; calyx of males cream ; calyx of females cream to light green ; stigma white ; ovary green.

Capsule : Antique green to light green with purple-edged wings.

Tuber : Of medium size ; surface slightly scaly, russet to tawny brown ; phelloderm white ; flesh yellowish white.

Habit : Foliage dense.

Distribution : Eheliyagoda.

MU. 46

(Debal-sinyokka)

Petiole : 26±0·5 cm. long, blackish red, horizontal and inclining, curved at the distal end.

Young leaf : Light green ; midrib red.

Mature leaf : Dark green, of medium size, with commonly 7 leaflets but number varies from 3 to 7 ; leaflets flat, bending down ; central leaflet 18±0·1 cm. long and 5±0·1 cm. wide.

Petiole scar : Blackish purple tinged green.

Stem : Dark green with shaded stripes when young, wood brown when mature.

Flowers : Males and females appear in abundance and almost simultaneously ; calyx of males and females pale green with Bordeaux shading ; stigma light pink ; ovary green with pink ridges.

Capsule : Antique green to bright green ; nectary carmine.

Tuber : Long, of medium thickness ; surface slightly scaly, apricot brown to salmon ; phelloderm Venetian pink ; flesh yellowish white.

Habit : Branching variable ; foliage moderately dense.

Distribution : Kotugoda.

MU. 47

(Alu-manyokka)

Petiole : 38±0·7 cm. long, yellowish green shaded red at the ends, alternately inclining and horizontal, curved at the distal end.

Young leaf : Light green ; midrib yellowish green to faint red.

Mature leaf : Dark green, of medium size, with commonly 7 leaflets ; leaflets plane, divergent, bending down at the tips ; central leaflet 20±0·4 cm. long and 6±0·1 cm. wide.

Petiole scar : Dark green tinged purple on the adaxial side.

Stem : Bright green when young, wood brown when mature.

Flowers : Do not appear.

Capsule :——

Tuber : Fat, of medium length ; surface scaly, kaiser brown to liver brown ; phelloderm light yellow ; flesh yellow.

Habit : Branching high and infrequent ; foliage very dense.

Distribution : Kotugoda.

MU. 48

(Manyokka)

Petiole : 27±0·8 cm. long, bright green with faint rose ring at the base and faint rose shading at the distal end, inclining, slightly curved at the distal end.

Young leaf : Bright purple ; midrib yellowish green.

Mature leaf : Dark green, of medium size, with commonly 7 plane, somewhat divergent leaflets ; central leaflet 18±0·5 cm. long and 5±0·1 cm. wide.

Petiole scar : Maroon.

Stem : Dark green when young, silver grey when mature.

Flowers : Both sexes abound and bloom almost simultaneously ; calyx of males cream with pink shading ; calyx of females pale green with alizarine pink shading ; stigma white ; ovary green with pink ridges.

Capsule : Antique green with pink ridges ; nectary dark green.

Tuber : Fat and short ; surface scaly, tawny brown with occasional pink and grey patches ; phelloderm white ; flesh white.

Habit : Branching variable, foliage sparse.

Distribution : Alawwa.

MU. 49

(Naddu-miyore)

Petiole : 26±0·9 cm. long, yellowish green with rose shading at the ends, horizontal, curved at the distal end.

Young leaf : Bright green ; midrib greenish yellow occasionally tinged with red.

Mature leaf : Dark green, of medium size, with commonly 7 stiff leaflets ; central leaflet 18±0·4 cm. long and 5±0·1 cm. wide.

Petiole scar : Light purple.

Stem : Bright green when young, wood brown when mature.

Flowers : Males few and late ; females more numerous and early ; calyx of females cream ; stigma white ; ovary green.

Capsule : Green ; nectary carmine.

Tuber : Fat and short ; surface scaly, kaiser brown to Hay's russet ; phelloderm white ; flesh white.

Habit : Branching high and infrequent ; foliage dense.

Distribution : Chenkalady.

MU. 50

(Kirinokku)

Petiole : 30 ± 0·8 cm. long, yellowish green with faint rose band at the base, and with ose shading at the distal end, alternately inclining and horizontal, curved at the distal end.

Young leaf : Purplish green ; midrib greenish yellow.

Mature leaf : Yellowish green, of medium size, with commonly 7 leaflets ; leaflets plane, divergent, bending down ; central leaflet 20 ± 0·5 cm. long and 5 ± 0·1 cm. wide.

Petiole scar : Yellowish green.

Stem : Yellowish green when young, silver grey when mature.

Flowers : Males and females appear in profusion and almost simultaneously ; cayx of males and females pale green with alizarine pink shading ; stigma white ; ovary greenl with pink ridges.

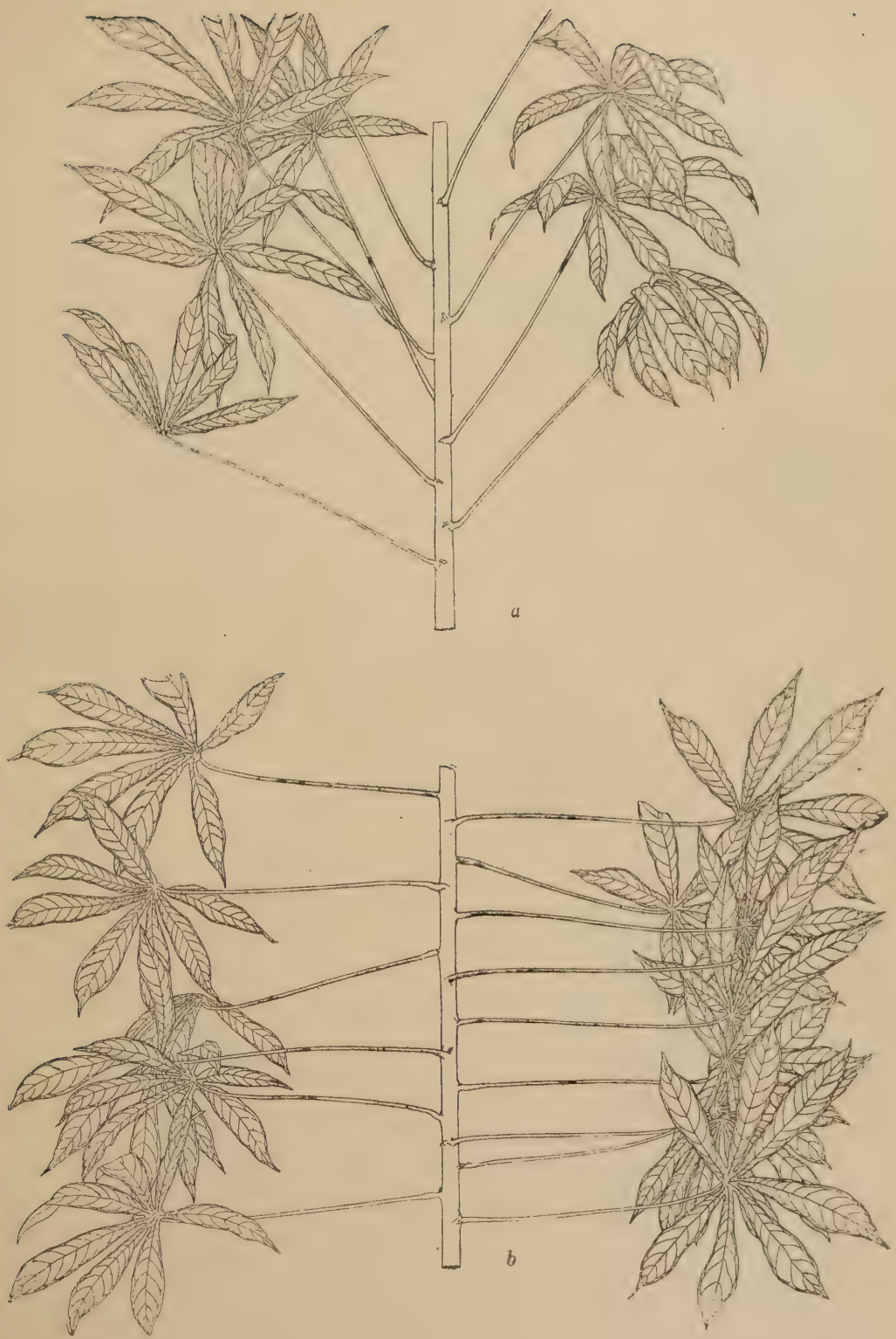
Capsule : Apple green with purple wings.

Tuber : Long, of medium thickness ; surface smooth, tawny brown to warm buff with occasional pink and grey patches ; phelloderm white ; flesh white.

Habit : Habit of branching variable ; foliage of moderate density.

Distribution : Matara.

(*Continued*)



Block by Survey Dept., Ceylon.

FIG. 1.—Illustrating types of petiole orientation.

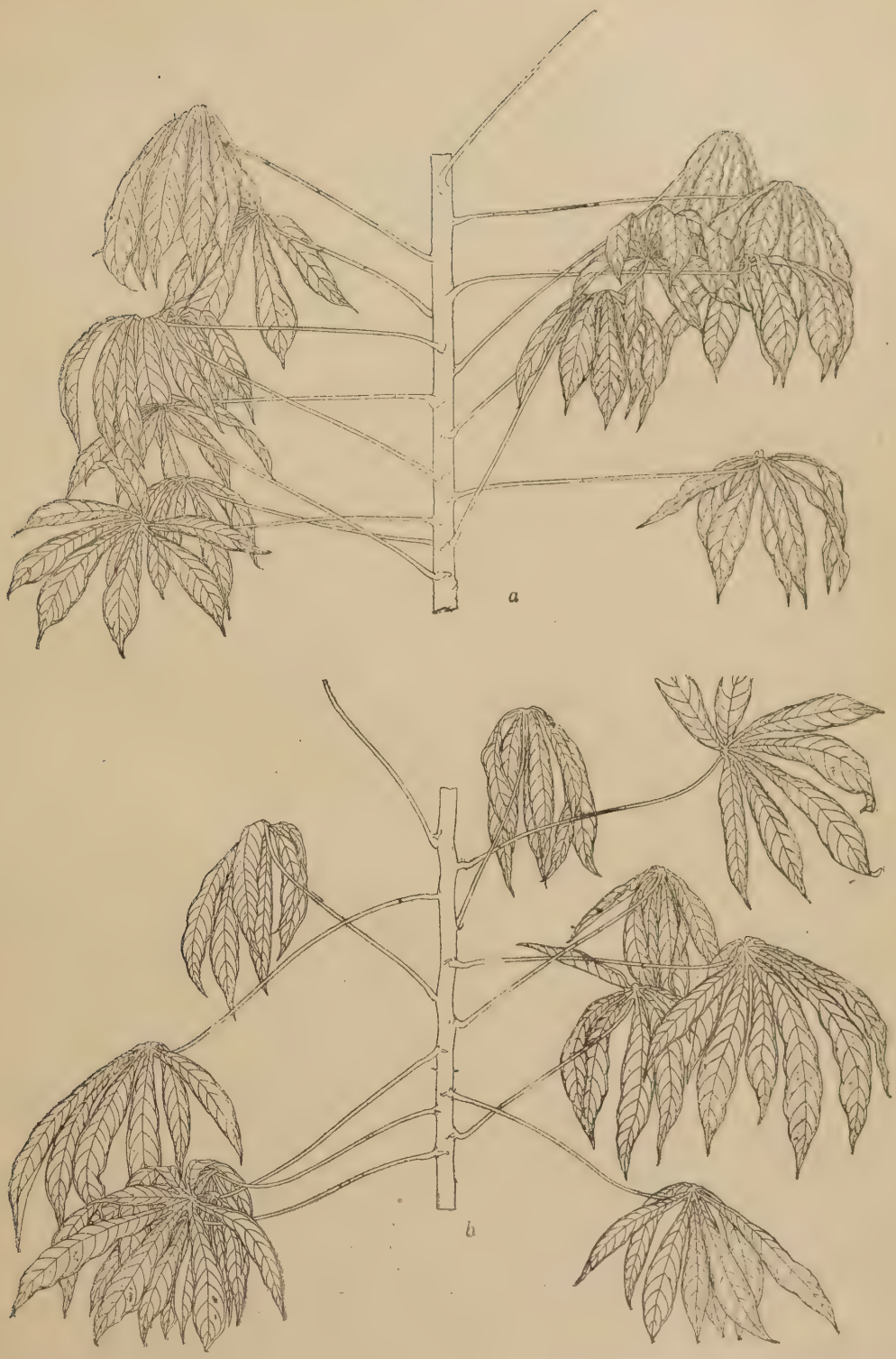


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FIG. 2.—Illustrating types of petiole orientation

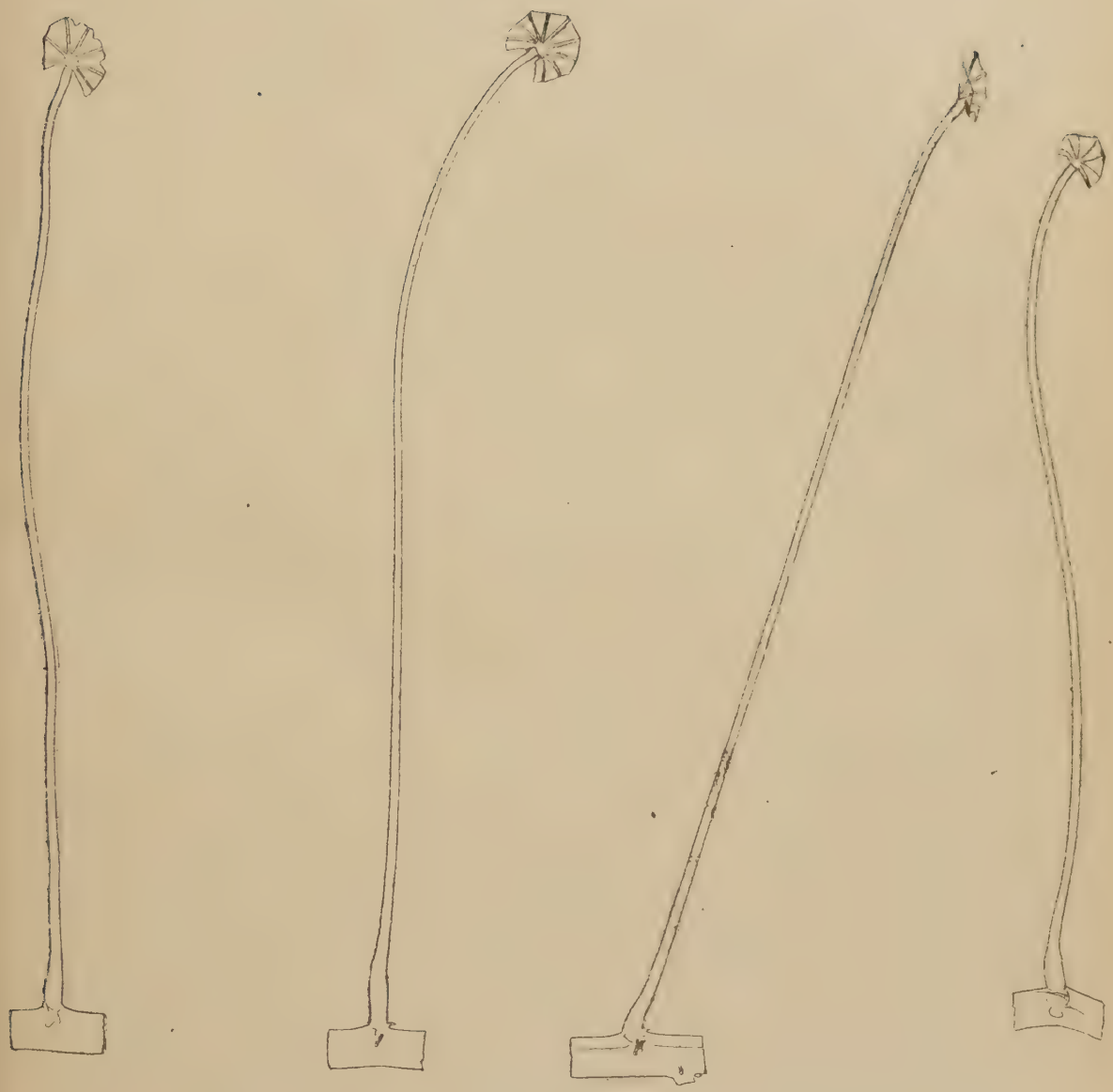

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FIG. 3.—Illustrating range of petiole shape.

DEPARTMENTAL AND OTHER NOTES

THE CONTROL OF INSECT PESTS BY AGRICULTURAL METHODS

BY

B. A. BAPTIST,

ENTOMOLOGIST

INTRODUCTION

INSECTS are the chief rivals of man for mastery in the organic world. They hold unquestionable sway in all those regions which man has not yet invaded, and in those parts which man is trying to utilize and convert to his benefit they are constantly challenging his supremacy and undermining his strength. The majority of insects consists of plant feeders and the vegetation of an area is the most important factor which determines their abundance or scarcity. Weather is the other factor and acts both directly on the insects themselves and indirectly through its effect on the vegetation which forms the food supply of the insects. Under natural conditions neither of these factors changes appreciably so that the insect population of an area remains fairly constant both with regard to the numbers in an individual species as well as the collective complex of the different species of the area.

The invasion of a natural area by man and its subsequent conversion to agriculture completely changes the environment of an area with regard to the food supply of the insects in it. The cultivation of special crops produces an abundance of one or more kinds of plants. This restricts the variety of the insect population to those species which feed on those particular host plants, but within this group the general level of the population goes up greatly, and many species, relatively scarce or insignificant under natural conditions, become abundant and prominent. If other conditions are favourable this increase in the insect population can occur to such an extent as to make the survival of the host plant itself problematical. Normally, man does not wait for the total destruction of his crops to realize the danger of the insect menace, but in so far as he delays to do so he intensifies the loss that is caused thereby.

The most important means man could exploit for the protection of his crops from insect damage is the proper arrangement of his agricultural activities so as to produce conditions antagonistic to the breeding and multiplication of harmful insects. In order to do this it is necessary for him to clearly understand the principal features of insect life and the nature of insect damage, and to appreciate the implications of agricultural activities.

THE NATURE OF INSECT DAMAGE

Insect life is characterised by a division into distinct stages which may be so different from one another both in appearance and requirements as to make the relation between these stages difficult to discern. The principal stages of

an insect's life are the *egg* or embryonic stage, the *larval* or growing stage, the *pupal* or quiescent stage and the *adult* or reproductive stage. The egg stage is generally provided with a very tough resistant shell, and though usually hatching within a short period can, in the case of certain insects, remain for a long period in a dormant condition, only hatching out when a plentiful food supply is assured. The larval stage which is the active growing stage is the principal feeding period of the insect. It is consequently the most damaging period from the point of view of injury to crops. It may be short or long, varying generally with the size of the insect. It is also by its nature the most exposed and the least resistant with regard to protection against weather and natural enemies. When the larva is full grown it is followed by a pupal or quiescent stage during which transformation from larva to adult takes place. It is distinct and appreciable only in those insects in which the adult differs greatly from the larva, as is the case between the caterpillar and the moth, the grub and the beetle or the maggot and the fly. As stated, the pupal stage is inactive and on its own account defenceless, but it is generally provided by the erstwhile larva with a protected situation such as an earthen cell or cocoon so that it is hidden away and protected from unfavourable weather conditions and natural enemies. Finally, there is the winged adult stage when the insect is at the height of its powers of resistance and locomotory activity and has also become capable of reproducing its kind. The resistance of insects as a group to severe or unfavourable environmental conditions is the most highly developed in the animal kingdom. In those species in which this is not the case there is a corresponding advantage in the possession of an extraordinary fecundity which is not only very high but extremely rapid, thus allowing a plentiful distribution of progeny over a wide range of habitat and ensuring the survival of the species under the most rigorous conditions the environment can impose.

The damage caused by insects to cultivated crops is of the most varied kind and practically no crop is immune from insect enemies. The commonest and most easily observed damage is that caused by leaf-eating insects. These insects all possess chewing and biting mouth parts and the damage caused may result in partial or complete destruction of the plant tissue, which may very seriously affect the crop ultimately produced. Another type of damage is that caused by the plant sucking insects which have piercing mouth parts and feed by sucking the juices of the shoots, stem, leaves, fruits, and seeds. Apart from the direct damage they cause, the injuries produced provide suitable avenues for the entrance of disease organisms while some insects are capable of actually transmitting diseases from affected to healthy plants. Another type of damage, which frequently results in the death of the part of the plant concerned, is that caused by boring insects to stems, shoots, fruits and seeds and by subterranean insects to the roots of plants.

THE CONTROL OF INSECT DAMAGE

With insects, as with all other evils which beset mankind, prevention is better than cure. This can be largely brought about as far as annual crops are concerned by the employment of proper agricultural methods. These include the selection of crops, the preparation of the land, the planting and general care afforded to the crop and its final disposal.

Under normal circumstances the selection of a crop involves the well-known principle of *crop rotation*, whereby the same crop is not grown on a particular piece of land in successive seasons, and in fact may not be grown for several seasons following. Apart from soil exploitation, this feature is a big factor in determining the insect population, since if the same crop is grown successively in the same place the insects which feed on it would tend to multiply and ultimately reach such numbers as to make the cultivation of that crop a very impractical proposition. If on the other hand a totally different type of crop is grown the insects whose host plants were the first crop would not be able to adapt themselves to feed on the new crop and would be consequently starved out. For this to be effected, however, it is necessary that the change or rotation of crops should involve the whole natural or geographical area and not merely small individual and contiguous plots or even larger but adjacent areas where intermigration would be easy. Under conditions of agriculture in Ceylon co-ordinated and extensive action of this nature is frequently not possible in areas in which natural conditions do not themselves impose the necessity for rotation. Under such circumstances particular attention must be paid to other features of crop culture.

The next important agricultural feature is the *preparation of the land* which involves the preparatory tillage of the soil and destruction of weeds, and the application of manure. Tillage includes ploughing or forking, which, apart from its other benefits to the crop to be planted, exposes all underground insects such as root eating grubs and resting or pupal stages of plant eating pests to unfavourable weather and predatory enemies such as birds. In this connection it is important to turn up the soil on the edges and the borders of the fields or other adjacent uncultivated areas as well, because it is in such areas which are normally protected by vegetation that underground insects find good shelter. Where underground insects are particularly serious or weeds difficult to control, tow ploughings might be usefully given, one a few weeks prior to planting and one shortly before planting. Underground insects on account of their position make such curative means as might be practised for other pests largely impractical and almost entire dependence has to be placed on prevention. The significance of manuring, adequate drainage and other factors which combine to enable the plants to show strong and healthy growth is that the crop quickly passes through the earlier stages of growth when the plants are relatively delicate and consequently when attack by insects might be serious or even fatal.

With regard to the actual planting of the crop it is important to select clean, healthy and well developed planting material, because not only is the accidental introduction of any pest thus prevented but vigorous growth is assured. Further, the planting material should be of a single or uniform variety and the time of planting so chosen as to let the plants have the maximum benefit of rainfall and general weather conditions. The time of planting should also be restricted so that the whole area is planted up not only at the optimum time but in as short a period sa possible. These features ensure the even development of the crop and their simultaneous maturing in the whole area. No opportunity is thereby given for insects to feed and breed progressively through the season as would occur if different stages of the crop were available throughout the greater part of the season in the area concerned.

Next in order are those cultural measures which can be grouped together under the caption of *clean cultivation.* This involves firstly the removal and destruction of weeds and unnecessary plants not only before planting but during the period of early growth. In Ceylon, where there generally tends to be inadequate soil preparation and where weather conditions favour a very heavy weed growth, the weed factor during the early stages of the crop is a very important one and, if not suitably dealt with, may on its own account make the cultivation thoroughly uneconomic. In addition, however, it provides excellent shelter and alternate breeding material for insect pests, which may thus be enabled to breed and multiply to such an extent as to cause an almost total destruction of the crop as soon as it reaches a suitable stage for attack. Secondly, there is included under clean cultivation what may be termed plant sanitation. This involves the regular, periodic examination of the crop for all sickly looking plants, which frequently contain boring insects which feed internally and cannot be easily detected and controlled in any other way. Periodic and timely removal and destruction of these plants or plant parts arrests the damage and prevents the breeding and multiplication of these insects. Lastly there is the matter of disposal of crop remnants after harvesting. From the point of view of soil fertility it is most desirable that the crop remnants should be ploughed in or, if this is not practicable, uprooted and burnt or composted. Some plant food is thus returned to the soil. From the point of view of insect control it is necessary to carry this out immediately after harvesting because in this way all insects feeding and harbouring in the remaining crop are immediately destroyed or are deprived of their food and shelter so that they ultimately die. In Ceylon, where crop rotation on the lines mentioned above cannot frequently be carried out, this prompt destruction of crop remnants after harvest is especially important in that it also prolongs that close period between the cultivation seasons during which no plants are available to the insect population for feeding, breeding or sheltering, thus reducing such insect pests to negligible numbers before the onset of the next cultivation. It is frequently possible to obtain a secondary crop after the main crop has been harvested but under the conditions first enumerated this is very undesirable, as the benefits derived from the secondary crop would be entirely lost by its serving as an admirable feeding and breeding ground for pests which would eventually ruin the cultivation following.

CONCLUSION

It will be seen from what has been already stated that, admirably effective as the measures advocated can be with regard to the control of insect pests, the success attending them would be incomplete and disappointing, if planning and co-ordination are absent in the agricultural activities of the population. Every measure represents a planned procedure, every action should be a part of a co-ordinated process, not merely in the activities of a single or even a group of cultivators, but of all cultivators big and small in the whole agricultural area. This cannot be achieved except by co-operation which in its turn requires the acquisition of knowledge and the benefits of organisation. In countries where land holdings are extremely large and agricultural facilities easily available or in areas where permanent crops are grown over large acreages such action is simple and natural. In countries

like Ceylon, however, where not merely are agricultural holdings generally fragmentary, but where progressive change is held up by poverty in knowledge of modern facilities, in possession of working capital, in enjoyment of physical health, little can be achieved except through some form of collectivisation, through which alone can action be properly organised and facilities made readily available. It is only under such conditions that it will be possible to introduce into Ceylon agriculture the modern processes of mechanisation, which, not only solves the hitherto insoluble problem of uncertain weather by enabling agricultural activities to quicken their tempo to keep pace with the physical change of the tropics, but makes, also, agricultural expansion possible by bringing health control in agriculturally exploitable areas within the realm of practical politics. It is only by virtue of these changes, which can be achieved by modern mechanisation, that agriculture could be raised in this or any country from the economic level of a casual migrant to that of a self-respecting and responsible citizen.

SEASONAL DISTRIBUTION OF FRUITS IN CEYLON

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HORTICULTURAL OFFICER

A GREAT variety of fruits is grown in Ceylon—greater than in most other tropical countries of comparable size. They vary from tropical fruits to subtropical, and even temperate zone fruits. Their cultivation is made possible by the wide regional variations in soil and climate found in the Island. These regional differences not only enable a wide diversity of fruits to be grown, but they also influence the season of fruiting and the quality of the fruit.

In California, where one variety of grapefruit—the Marsh Seedless—is grown in four climatic zones, the picking season starts in November in the low elevation desert with its intense summer heat and mild winters and ends the following October in the southern coastal belt where the summers are moderately cool and the winters mild. The fruit produced in the desert region has a better flavour and colour than the fruit in the coastal belt which tends to be more acid and bitter. Similarly by growing two varieties of sweet orange, the early Washington Navel and the Late Valencia, in three climatic zones—early, late, and intermediate—Californian growers are able to pick oranges all the year round. The growing of an early variety in an early district and a late variety in a late district enables the season to be extended considerably.

Citrus trees in Ceylon generally flower at the beginning of the rainy season on the new flush produced with the first rains, while other fruits like mango and avocado flower during a dry spell at the end of the rainy season, the flowers being produced on the previous season's growth. Consequently, the fruiting season is liable to be advanced or delayed by a few weeks with the early or late arrival of the monsoon and its duration. In the low-country dry zone which gets the benefit of the north-east monsoon from October to early January, citrus fruits are produced during one season from about April to July, but with irrigation during the dry months some fruit can be produced during the off season. In the wet and semi-dry zones which get both the north-east and south-west monsoon Citrus fruits are in season twice a year from March to July and September to December with peaks in May and November. The main season for mango in the wet and dry zones is from May to July, but a small crop is sometimes produced in the dry zone in November and December. If unseasonal rains occur in January and February, as often happens in the sem-dry areas—Wariyapola and Hingurakgoda—hardly any crop is produced during May to July, but the trees flower again and produce the main crop from November to early January.

Apart from seasonal variations associated with soil and climate there exist varietal differences in season of fruiting depending on whether the variety is inherently early, mid-season, or late. At the citrus experiment station at Bibile, the Valencia Late orange matures eight to ten weeks later than the Washington Navel, while at Hewaheta the interval is only 6 weeks. But

the local Bibile sweet orange comes into maturity earlier than the imported varieties. In the dry zone, Foster grapefruit is early compared to Walters which is a mid-season fruit, while Marsh Seedless is late. The Mauritius variety of pineapple is in season 4 to 6 weeks earlier than the Kew variety. At Hingurakgoda Sabre mango is the first to come into season and is followed by Willard, *Vellai Columban* (Jaffna), *Karutha Columban*, and *Ambalavi* which is the last to mature.

Some varieties of sweet orange such as the Valencia Late and Vavuniya sweet can be held on the trees for several weeks in good condition after they are mature enough for picking provided they are not attacked by fruit fly and fruit piercing moth, which can do considerable damage to late season fruits.

The mature fruit which becomes light yellow as it ripens turns green again and this change may occur several times, but if left too long the fruit becomes puffy, dry, and insipid. The seedless character of the Marsh variety of grapefruit makes it possible to hold the fruit long on the tree without any danger of spoilage through seed germination within the fruit.

Fruits produced at a higher elevation generally tend to come into season later than in the low-country. This is especially true of the durian, rambutan, and mangosteen which are in season at Peradeniya about July-August, but are a month or two earlier in the low-country. Cherimoyers are in season at Bandarawela from late July to early September, but at a higher elevation at Ambawela they are in season from November to December.

The following is a classification of the fruits grown in different climatic zones of the island :—

(i.) *Low-country wet, semi-dry, and dry zones (sea level to 1,500 ft.), and mid-country wet zone (1,500–4,000 ft.)*

Breadfruit, cashew, custard apple, grapefruit, guava, jak, lime, mango, mandarin, sweet orange, papaw, passion fruit (yellow), pineapple, plantain, pomegranate, sapodilla and soursop.

(ii.) *Low-country and mid-country wet zones only, average annual rainfall 80 inches and above.*

Avocado, Brazil cherry, Calcutta guava, Ceylon gooseberry, durian, lovi-lovi (*Flacourtia inermis*), mangosteen, rambutan, uguressa (*Flacourtia ràmontchi*).

(iii.) *Low-country dry zone only (average annual rainfall being up to 60 inches).*

Cantaloupe, grapevine, pomegranate, jujube (*Ziziphus jujuba*).

(iv.) *Mid-country semi-dry zone (2,000–4,000 ft.).*

Calcutta guava, cherimoyer, lemon, lime (Tahiti seedless) litchi, loquat, mandarin, marmalade orange, sweet orange, persimmon, passion fruit (purple).

(v.) *Up-country wet zone. (4,000 ft. and above).*

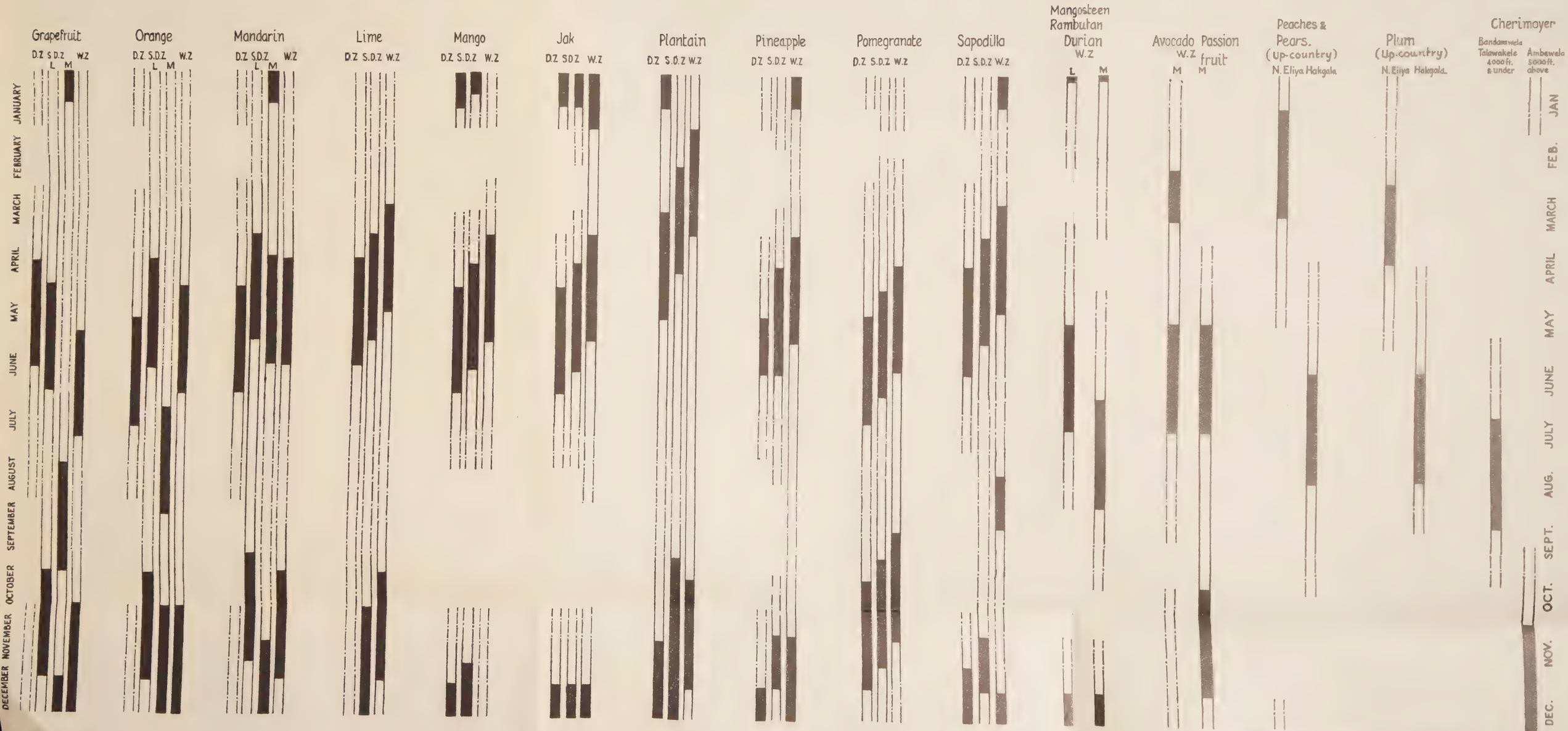
Blackberry, Cape gooseberry, mountain papaw, passion fruit (purple), peach, pear, plum, and tree tomato.

Most of the fruit trees with the possible exception of well established mango, pomegranate, cashew, and jujube trees require irrigation or hand watering in the dry zone in severe drought in July to September. In the semi-dry up-country areas where the nights are cocl and the days warm citrus fruits colour naturally on the tree. They also do so at Embilipitiya, but in most other parts of the low-country they hardly change colour when mature. Moreover, the up-country sweet orange and pineapple tend to be more acid than the low-country fruit. Grapefruit grown up-country is more acid and bitter than the fruit in the low-country dry zone where it develops the best flavour. Fruits such as the mango, sweet orange, and mandarin produced in the wet zone are not generally so sweet as the same varieties grown in the dry zone. The soil too is believed to influence the development and flavour of the fruit. Fruits grown in the calcareous soils in the Jaffna Peninsula are generally of better quality and flavour than those produced elsewhere. But the rainy season fruit is of poor quality compared to the fruit produced during the normal season in June–July when the weather is dry.

The seasonal distribution of the more common fruits with the exception of plantain and papaw, which are available all the year round, is as follows :—

Variety of Fruit.	Experiment Stations and Principal Localities Where Available During Season.	Season.
Grapefruit ..	*Main crop.* Anuradhapura, Hingurakgoda, Pelwehera (Dambulla), Nalanda, and Peradeniya Experiment Station (Small crop)	April to June
	Main crop. Vavuniya and Bibile ..	May–July
	Bibile (small crop) Peradeniya (Main crop) Hingurakgoda (small crop)	October–December
Oranges ..	*Small crop.* Peradeniya Experiment Station	March–May
	Main crop. Hingurakgoda, Pelwehera (Dambulla), Nalanda, Embilipitiya	April–June
	Main crop. Vavuniya, Bibile, Moneragala	April–August
	Small crop. Bibile ; *Main crop.* Peradeniya	September–December
Mandarin ..	*Main crop.* Vavuniya, Nalanda, Malpotha (near Welimada), Pelwehera (Dambulla), & Bibile	April–July
	Small crop. Bibile, Welimada ..	November–December
Lime ..	Bibile, Moneragala ..	February–July ; November–December
	Vavuniya, Omantai, Dambulla ..	March–June ; September–December under irrigation
Mango ..	*Main crop.* Jaffna, Pelwehera (Dambulla), Nalanda, Peradeniya	May–July
	Small crop. Hingurakgoda, Wariyapola ..	May–July
	Small crop. Pelwehera (Dambulla), Nalanda	November–mid. January
	Main crop. Hingurakgoda and Wariyapola	,, ,,
Passion Fruit ..	Lover's Leap, Nuwara Eliya ; Purple Variety	March–August ; October–January
	Peradeniya ; Yellow Variety ..	May–October
	Galle (Labuduwa), Yellow Variety ..	June–September
Pineapple ..	*Main crop.* Peradeniya, Gampaha, Veyangoda and Nawala	March–July
	Small crop. do.	November–January

SEASONAL RANGE OF PRODUCTION OF CEYLON FRUITS



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Variety of Fruit.	Experiment Stations and Principal Localities Where Available During Season.	Season.
Sapodilla ..	Wariyapola, Jaffna	February–August; November–January
	Peradeniya	March–May ; July–October
Guava ..	Anuradhapura, Nalanda	April–June ;
	Malpotha, Bandarawela and Welimada ..	July–September
Brazil Cherry ..	Peradeniya	January–February ; July–August
Avocado ..	*Small crop.* Peradeniya	February–April
	Main crop. Peradeniya, Katugastota ..	June–September
Durian ..	Bandaragama	June–July
	Peradeniya	July–August
Mangosteen ..	Kalutara, Bandaragama, Gampaha, Labuduwa	May–July
	Peradeniya, Kadugannawa ..	August–September
	Small offseason crop, occasionally, Peradeniya	February

The seasonal range is indicated in the accompanying chart.

TRACTOR CULTIVATION OF PADDY FIELDS IN THE EASTERN PROVINCE

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INTRODUCTION

THE use of tractors in Agriculture had not up to last year been tried on any appreciable scale in Ceylon. A contrast is provided in other countries, particularly Western ones, by the rapid strides made in this direction. The multiplicity of tractor models and variety of ancillary equipment give a rough idea not only of the progress made but more so of the experience gained. In the United States of America in 1937 over a million and a quarter tractors were in use and the annual horsepower hours on farms for ploughing &c., were about 2½ billion. In Canada during the period 1921–1931, the number increased from 47,000 to 105,000. In Russia, where mechanization has developed systematically, there were 380,000 tractors totalling about 6,500,000 h.p. in use in 1936. There were no tractors in use in Great Britain at the beginning of this century, but in 1931, the number rose to over 20,000. From that year up to 1934, the annual sales of tractors averaged 4,000, while in 1936 and 1937 the sales rose to 7,000 and 9,000 respectively. In the latter year there were over 48,000 tractors in use in England and Wales and this number rose to over 150,000 in 1943.

The desire for mechanical power in agriculture has not been confined to the Western countries. In Siam, the cultivation of paddy lands by tractor drawn implements has been carried out by some enterprising Chinese since 1930. Rhodesia has not been slow to appreciate the value of tractor machinery because tractors formed part of the normal farm equipment before 1929. In India trials were conducted with the Fordson Tractor at Pusa in 1919, but the use of machinery in cultivation has not been so wide-spread because of the small size of the holdings which are mainly in the hands of the peasants—conditions which are similar to those in Ceylon.

With a view, therefore, to popularizing the use of machinery—particularly in paddy cultivation—and to show how peasants could adopt this type of cultivation by organizing themselves into co-operative farmers' societies, a large scale demonstration was carried out in the Eastern Province in the *Maha* 1943–44.

An area, 203 acres in extent, of privately owned fields was taken up for this purpose late in July, 1943, on the agreement that the cultivators should pay a normal sum of Rs. 12 per acre for all operations from ploughing to

sowing. The land was thereafter to be handed back to the cultivators who would be responsible for such subsequent operations as fencing, irrigation, weeding, watching and harvesting.

NATURE OF LAND AND SOIL

This *Kandam* (about 934 acres in extent) is the oldest paddy tract in the Batticaloa District. It is reckoned to be about 700 years old, and, lying as it does on the Eastern section of the Batticaloa-Pottuvil Main road which forms an effective barrier against any flood water from the Pattipolai Aru coming in, does not benefit by any form of silting. Consequently the yields have always been very low—in fact the lowest under the Pattipolai Aru Scheme. The soil types vary from sandy to clayey.

DETAILS OF WORK DONE

As it was necessary to make the bays as large as possible in order to let the tractors have a long run and thereby save time in turning, several ridges had to be removed. This work was started in late July and was continued till September. Over 6 miles of bunds were thus demolished by manual labour. The first tractor and a second-hand disc-gang plough and disc harrow arrived in the second week of August when ploughing was started immediately. Owing, however, to the hard nature of the soil one of the discs of the old plough broke after about 3 acres had been done and ploughing was continued with the remaining 3 discs in the plough. This reduced the output by 25 per cent. and put up the cost proportionately. With the ploughing of a further 10 acres, it was found that the wear on the discs was considerable—about one inch of the diameter having worn away during the ploughing of this 10 acres. It was therefore decided that no further ploughing should be undertaken till there were a few showers of rain.

No rain fell till the 30th of September when the downpour was so heavy that work was held up for 2 days till the tractors could be put on the land. The Government manure mixture consisting of bone-meal and groundnut cake was thereafter applied at the rate of 3 cwt. per acre and the area harrowed. About 81 acres were sown dry and the rest of the area sown wet with pureline *Vellai Ilankalayan* paddy. Sowing commenced in late October and was completed by late November.

As mentioned earlier, the agreement was that the land should be handed back to the cultivators after sowing was completed. But the cultivators did not adhere to their part of the agreement. They did not fence the area in time. Neither did they attend to irrigation. The results were that (*a*) there was very severe damage by stray cattle and (*b*) the young plants commenced to yellow due to lack of water. Weed growth also became very profuse as a result of the failure to irrigate at the right time. At this stage, in spite of the severe setback the young seedlings had received, the land was taken over again and all operations carried out by the Department. By mid-January all the plants had completely recovered and the growth was excellent. At flowering time in February, however, there were unusual and exceptionally heavy rains ; a total of over 27 inches was recorded as against an average of only 3.1 inches for over 30 years. This resulted in a very high proportion of chaff.

Harvesting was done on a strictly randomized principle. A total of 38 one-eighth acre plots was harvested and threshed and the results analysed. The yield figures are given in Table I.

RESULTS

Total area cultivated in tract	..	..	$801\frac{3}{4}$ acres
Area tractor worked	..	..	203 ,,
Area cultivated by village methods	..	..	$598\frac{3}{4}$,,
Average yield per acre of tractor worked area	..	..	44.15 bushels
Average yield per acre in remaining area	..	..	16.7 ,,

The above results show a very substantial increase in the tractor worked area. The yield is well over $2\frac{1}{2}$ times that obtained in the rest of the area. The average yield obtained in *Maha* 1942–43 from this tract was 18·7 bushels per acre. The lower average obtained in *Maha* 1943–44 is entirely due to the adverse weather conditions experienced during flowering. The extent of the damage caused by the unusually heavy rains can be gauged from the fact that in the plot from which the highest yield of 108 bushels per acre of unwinnowed paddy was recorded, no less than 43 bushels constituted unfilled grains. In a normal year chaff is usually less than ten per cent. of the crop. This year, however, chaff amounted to 29·41 per cent. of the crop harvested from the tractor worked area. The actual yield of unwinnowed paddy from this area was 62·53 bushels per acre. Making an allowance of 10 per cent. chaff in a normal year it will be seen that 19.4 per cent. of the chaff should have yielded grain. This would have amounted to over 40 per cent. of grain. Thus the yield should have been over 59 bushels per acre in the tractor worked area after making an allowance of 5 per cent. for the few bunds left.

CONCLUSIONS

The results which show an increase of a little over 25 bushels per acre after making the allowance referred to above indicate beyond doubt the vast possibilities for paddy cultivation in Ceylon. Basing the calculation on the accepted cycle of good and bad years in Agriculture and on the fact that this year of trial was the worst of the cycle, it would be safe to assume that the average annual production over the period of the cycle could be not less than 75 bushels per acre. This figure does not provide for the fact that with the continued use of tractors, soil conditions would improve. Apart from the substantial increase in yield that will result from the use of machinery because thorough tillage is possible—and at the right time—two very great advantages that should be taken into consideration are (*a*) a considerable saving in labour and (*b*) a very much more economical use of irrigation water which saving should be available for cultivating extra land. Another important factor is the effect tractor cultivation has on costs of production. In the Eastern Province where buffaloes are used, the average cost from mudding to sowing was Rs. 30 as against Rs. 13·75 per acre for tractor working from ploughing to sowing. It should be noted that this amount which includes depreciation on machinery, transport, cost of fuel, lubricants &c., at market rates, for tractor working the area is relatively high, because after

the breaking of the ridges, the fields were not level and had therefore to be worked several times with the meagre ancillary equipment available in order to bring them into a state which would permit of irrigation in large bays. Hence at least half the amount should be really regarded as capital expenditure and the working cost of the same area in subsequent seasons would be proportionately less.

If tractor cultivation is to be adopted on a large scale, it should of necessity be on co-operative lines, and co-operative farmers' societies should be formed in each tract. One lamentable feature in these tracts is the absence of permanent fences. This should receive first consideration from the societies, because, it is only then that rotational cultivation in paddy fields will be possible. With the large increase in yield that will be obtained by intensive cultivation, all improvements such as fencing, levelling, grading, drainage, planting of *Gliricidia* along the bunds, &c., could be done on a share basis. Even if a very low yield of 45 bushels per acre is obtained, there is yet a considerable margin of profit to effect the necessary improvements during the first two or three years itself on the following basis :—

Part liquidation of capital expenditure	..	..	10	bushels
Working expenditure including depreciation	..	..	15	,,
Permanent improvement ..	..	..	5	,,
Members' share ..	..	..	15	,,

All colonization schemes should also be worked on co-operative lines. Here, it is possible to introduce such smaller machinery as garden tractors, if the schemes are not large enough to warrant expenditure on large 30–40 h.p. tractors. These garden tractors are capable of ploughing about 2 acres of land a day.

If mechanized farming is introduced the question arises what should be done with the large herds of buffaloes now used for mudding. It must be mentioned that no scheme of rotation could be complete without the introduction of mixed farming. The responsibility for the care and maintenance of neat cattle and buffaloes should rest with the farmers' societies. Each society should appoint herdsmen whose duty would be to feed and provide water for the animals, drive them to pasture grounds during the day and back to the stockade at night. The droppings can be collected and turned into compost. Eventually a clean milk supply can be organized. Grading on systematic lines by the use of stud animals can also be effected best through these societies.

It will be seen that there is a very strong case for the immediate introduction on a large scale of tractor machinery for agricultural operations on organized lines. If this is done it would be possible to make the Island self-supporting in the matter of foodstuffs within a comparatively short period.

ACKNOWLEDGMENT

The author wishes to record his great appreciation of the work done in this connection by Mr. H. L. Wijesekera, Agricultural Instructor.

TABLE 1—YIELD OF PADDY IN TRACTOR WORKED AREA

Plot No.	Yield $\frac{1}{8}$ acre plots: Unwinnowed paddy Bushels	Yield $\frac{1}{8}$ acre plots: Winnowed paddy Bushels	Yield per acre: Unwinnowed paddy Bushels	Yield per acre: Winnowed paddy Bushels
1	12·13	8·40	97·0	67·13
2	7·75	6·33	62·0	50·67
3	6·00	4·67	48·0	37·33
4	8·13	6·38	65·0	51·0
5	3·5	2·73	28·0	21·83
6	4·0	3·05	32·0	24·42
7	4·5	3·13	36·0	25·0
8	4·5	3·63	36·0	29·0
9	7·25	5·23	58·0	41·83
10	7·0	5·08	56·0	40·67
11	10·0	6·65	80·0	53·17
12	—	8·21	—	65·67
13	9·0	6·56	72·0	52·5
14	7·0	5·25	56·0	42·0
15	6·5	5· 0	52·0	40·0
16	—	7·17	—	57·33
17	—	6·85	—	54·83
18	—	4·04	—	32·33
19	—	6·69	—	53·5
20	—	7·06	—	56·5
21	—	5·33	—	42·67
22	—	5·77	—	46·17
23	—	5·54	—	44·33
24	—	5·85	—	46·83
25	—	6·52	—	52·17
26	8·75	5·46	70·0	43·67
27	7·5	4·83	60·0	38·67
28	10·0	5·29	80·0	42·33
29	—	4·56	—	36·5
30	8·25	5·71	66·0	45·67
31	6·75	4·58	54·0	36·67
32	13·5	8·13	108·0	65·0
33	—	4·5	—	36·0
34	8·5	5·5	68·0	44·0
35	10·08	5·75	80·67	46·0
36	8·5	5·75	68·0	46·0
37	—	3·23	—	25·83
38	8·5	5·35	68·0	42·83

THE FLOWERING TREES OF AMERICA

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CURATOR, ROYAL BOTANIC GARDENS, PERADENIYA

THE normal dry season at Peradeniya rarely exceeds a period of six weeks or so, occurring during the months of January and February. This year, however, this dry spell extended over the exceptional period of between eleven and twelve weeks with the result that our trees and shrubs developed their flowering characters to an extent rarely seen before.

Tabebuia Guayacan. Hemsl.

A new and fine flowering tree.

Of the great variety of flowering trees that now flourish in Ceylon, the majority of which have incidentally been introduced from other countries, few can exceed in beauty our recent introduction from Panama and botanically known as *Tabebuia Guayacan.*

The seed of this plant was received with a batch of others from Prof. Balme of the Botanical Exploration Institution, Mexico, in February, 1933. Only a few seeds germinated and of the seedlings raised, three were planted in the Gardens in December, 1934. The specimen (not reproduced) is the tree planted near Curator's Office in a particularly open site free from roots of other trees and open to sunlight the greater part of the day.

Growth has been satisfactory throughout though soil is of a poor cabooky nature and only the normal attention such as watering and stirring around the bed in its young days has been given the plant. Our experience of the tree and a study of its habitat indicates that the tree should thrive well from sea level to about 3,000 feet in the moist zones and probably with greater success in the semi-dry and dry zones.

The tree has not set any seed though flowering so profusely and it is apparent, as with some other trees such as *Cassia multijuga*, that dry zone conditions are necessary for fruiting functions. Propagation by gootee is therefore in hand and distribution will be made to drier areas in order to obtain seed so that it may be propagated and distributed on a large scale.

Wherever grown and flowered it will undoubtedly be a very conspicuous feature of the landscape. It has reddish purple to deep maroon large and trumpet shaped flowers with a yellow throat, produced in compact clusters on every branch and twig. To Europeans its counterpart would be that of the Rhododendron of gigantic dimensions and particularly floriferous. It lasts in flower for three to four weeks after which it is deciduous for two or three weeks. This tree is a decided asset to Ceylon's long list of flowering trees.

Tabebuia argentea. Britton

(*Syn. Tecoma argentea. Bur. & Schum.*)

Another rare and beautiful flowering tree

The past dry season has developed the flowering characters of this plant at Peradeniya as never before. The flowers of this species are a clean canary yellow, are borne in large bell-like clusters on all parts of the branches, intermingled to advantage with the grey silvery leaves from which it obtains its specific name.

The tree is a recent introduction, seed having been received from the Bureau of Plant Industry, Washington, U.S.A, in August, 1931, under the name of *Tecoma argentea.* Germination was good and many seedlings raised, a few being planted in the Gardens and the rest distributed to outside gardens. Hitherto the garden trees had flowered somewhat sparsely but in the recent long sunny spell these trees flowered to their maximum and were a wonderful sight.

The habitat of this species is Paraguay and its growth and progress at Peradeniya indicates that it is more particularly suited to the drier zones, particularly Uva side of the country. It has a somewhat restricted habit of growth and should be ranked among the smaller growing flowering trees. It has this year set fruit for the first time so that its multiplication is assured and seedlings become available for disposal at Peradeniya from now onwards.

Tabebuia serratifolia (Vahl) Nichols.

(Syn. Tecoma araliacea D.C.)

A very fine flowering tree.

A valuable acquisition among the garden flowering trees is the above named. It is on a par with the previously described species *Tabebuia Guayacan* if not even more floriferous, the flowers, being a rich golden yellow which really needs to be seen to be fully appreciated. The illustration gives some idea of the freedom with which the tree flowers.

The older specimens flower in March–April, whilst the younger plants usually flower earlier, in February and March, the older lasting in full flower for a period of five weeks or so, whilst the younger last three weeks or so, the new young growth forming earlier in the younger trees than in the older. It has not seeded at Peradeniya as yet, our plants being raised by root cuttings, but does so at higher Uva elevations or where there is no S. W. Monsoon rains.

It is a tropical tree of the West Indies and of British Guiana and in Ceylon is suited to both wet and semi-dry regions and to an elevation from sea level to 4,000 feet. In its habitat it is recorded chiefly as a timber tree and no record is made of its flowering properties which is surprising since this tree must be one of the most spectacular of the world's flowering trees in its season. Very little is in fact known or recorded of any of the Tabebuias (which are all of Tropical America and the West Indies) either botanically or commercially. It is known as the " Yellow Poui " of Trinidad, or " Washiba " of British Guiana. The history of the Garden's original trees is obscure, yet it is a fairly recent introduction, of about 1910 or 1911. When the writer joined the Gardens in 1914 there were among other interesting plants in the nursery a batch of seedlings of about two or three years of age bearing the label *Tecoma leucoxylon* but which bore little resemblance to our trees growing under this specific name. In the monsoon months of the same year plantings were made in the arboretum Natural Order and in other portions of the Gardens. In 1926 the arboretum plant flowered and specimens were sent to Herbarium for correct identification and the Systematic Botanist thus established the species as *Tecoma araliacea D.C.* (D.C. Prodx. IX 221 (1845)) and it has since then borne this name in the Gardens.

On a further check for purposes of the present notes however it is observed that a later investigation into the species of the Tabebuias of America by Sprague and Sandwith, presumably on material collected during the Oxford University Expedition to British Guiana in 1929 (Kew Bulletin for 1932, pages 18 and 93), it was established that *Tecoma araliacea* of Brazil is synonymous with *Tabebuia serratifolia* of West Indies and Venezuela. The new classification has however yet to appear in the Kew Index Supplement which is normally our Garden's guide to nomenclature.

Tabebuia rosea D.C.

A pink flowering Tabebuia

A good garden standby among the flowering trees and one that can always be relied upon to make an exceedingly fine show in the drier months of the year is the pink Tabebuia (*Tabebuia rosea*). So well does this species grow at Peradeniya that the parent trees have reached a height of 84 feet and base circumference of 12 feet with a fine rounded head, and at flowering time they are a sight to behold with their masses of pale pink to pale mauve bell-shaped flowers borne on every branch of the tree. Full flowering continues over a period of a fortnight or more with intermittant flowering for a week or so before and after. In the later period immediately after full flowering, the ground is literally carpetted with pinky mauve flowers.

Records show this tree to have been received here in 1881 and the original trees still remain in the South Garden near Director's bungalow. Its habitat is Venezuela and the West Indies and in Ceylon it thrives well from sea level up to about 3,000 and 4,000 feet. It is not particular in its soil requirements but does better in a heavier loam or cabooky soil than in a sandy soil. It is suited to both wet and semi-dry zones and to the dry zone also in any situation such as near a well, where it can occasionally obtain water. Since the tree seeds freely its distribution is becoming a wide one and this fine species is now recommended as a roadside tree also.

PADDY CULTIVATION WITH SPECIAL REFERENCE TO THE RESULTS OF DEPARTMENTAL TRIALS

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INTRODUCTION

THE average acre yield of paddy in Ceylon is stated to be the lowest in the World. Comparison is often made with yields obtaining in other countries such as Japan, China, Java, some parts of India, Australia and some Mediterranean countries where conditions are pre-eminently suitable for the production of higher yields. There is little variation from year to year in climatic and seasonal conditions, long hours of clear sunshine which favour higher yields are experienced and the soils are more fertile being of recent volcanic or alluvial origin. Moreover, except under deltaic conditions only one long-termed crop is grown a year, intensive methods of cultivation and very heavy manuring being adopted. Rice, being the staple crop in Ceylon, is cultivated near the homesteads whether conditions are favourable or not and the cultivation is carried on throughout the country under widely varying environmental conditions. In the arid dry zone the crop is cultivated under irrigation, in the wet zone, sometimes under irrigation by temporary dams across streams but more usually under rain-fed conditions, from sea-level up to an elevation of about 4,000 feet and in soils varying from marshes with high peat content to stiff clay or almost bare sands. Often heavy rains early in the season damage large tracts of newly sown fields. Ceylon paddy soils have been cultivated for over a thousand years and as a result some of the mineral plant foods are in short supply. In certain districts, *e.g.*, the rain-fed *manawari* districts of the Northern and Eastern Provinces and in the low-lying coastal districts of the North-Western, Western, Southern and Eastern Provinces paddy cultivation is hazardous undertaking because it may fail on account of irregularities in rainfall, liability to damage by floods and/or influx of salt water. The Irrigation Schemes are designed to supplement rainfall, hence in the dry season only greatly reduced areas could be cultivated. Unlike in other countries short-termed varieties, which as a rule yield less than long-termed varieties, are cultivated in practically all the paddy growing districts in the *maha* season except in a very limited area. Two crops a year are bound to tax the fertility of an already depleted soil. The statistics in regard to the acreage under paddy and the yeilds are misleading. Within recent years large extents of paddy land in suitable compact blocks with an assured supply of water have been opened through the far-sighted policy of the Honourable the Minister for Agriculture and Lands, in addition to the areas asweddumized by individual effort. In the present emergency a considerable extent of new areas have been opened and abandoned areas brought back into cultivation.

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The statistics now gathered by the Land Commissioner indicate that the earlier computation of acreage of cultivable paddy land on which the acre yield of paddy in Ceylon was based was over estimated. Although the average acre yield is not as low as it is believed to be, yet the above-mentioned adverse factors tend to keep the level of yield low. In considering these facts it should not be inferred that the yields obtained in Ceylon could be considered satisfactory. The factors which influence yield of paddy are numerous, complex and inter-related. Local yields could be raised appreciably with a little more effort. Some of the main factors which militated against the adoption of improved methods of cultivation in the past were: (*a*) cost of production which was invariably in excess of the fluctuating low market price of paddy, (*b*) scarcity of both human and animal labour in the larger paddy growing districts, (*c*) fragmentation of holdings, and (*d*) insecurity of tenure and lack of encouragement to tenant cultivators for effecting improvements and increases in yield. It is merely the traditional dignity attached to this industry which enable it to survive in the face of competition from more paying crops. The yields obtained on Departmental Stations in various parts of the Island by the adoption of improved methods of paddy cultivation, systematic manuring and use of improved seed clearly indicate the possibility of increasing local production very considerably. As paddy is cultivated under such widely varying conditions it follows that cultural practices best suited to each set of conditions are likely to vary. Through empirical methods sanctified by age various cultural practices have been evolved and one should be diffident in suggesting changes without preliminary investigation *in situ*.

Since the inception of the Paddy Division about 6 years ago a series of cultural and manurial trials, in addition to selection work, were conducted at some important centres to determine what improvements on existing practices may be possible. The cultural and manurial practices discussed below are based on the experience gained by these trials.

PREPARATORY TILLAGE

On a rough computation about half the paddy lands is prepared for sowing by flooding of fields, mudding with buffaloes and levelling under foot. Of the remaining half, two-thirds of the area is ploughed with the village plough and to a small extent with the light iron plough, cross-ploughed and levelled with levelling boards. The remaining one-third is worked with mammoties and levelled under foot or with hand levelling boards.

Preparatory tillage could be performed more economically and efficiently by the adoption of implemental tillage, particularly the light-iron plough, for the preliminary ploughing, followed by the wooden toothed harrow about a fortnight later after the weeds have decomposed under water, and again a week later for a final thorough puddling and levelling—two essential features in the management of a paddy soil. Except when a heavy weed growth or a green manure crop has to be turned in, preliminary differences in first ploughing are not so important as final thorough mudding into a consistency of thick gruel. The results of an experiment at the Batalagoda Paddy Station, designed to study the effect of the different systems of cultivation in vogue in Ceylon, carried out over a period of nine seasons

beginning from *maha* 1939–40 season, reveal (1) the economic superiority of ploughing over mammotying and (2) the superiority of improved ploughs over the village plough.

The increased yields obtained as a result of buffalo mudding under conditions obtaining at Batalagoda may be due to the fact that buffalo mudding churns the soil better. In addition it might have helped to regulate drainage better by the formation of a temporary pan in such a light soil where drainage is excessive.

LEVELLING

Levelling of paddy fields in general in Ceylon leaves much to be desired. Poor levelling results in :—

(*a*) failure of a considerable number of seedlings to establish themselves,
(*b*) inefficient and uneconomical utilization of irrigation water,
(*c*) difficulty in inhibiting weed growth with the normal supply of irrigation water.

DRAINAGE

Both surface and underground drainage are as important as irrigation. Lack of adequate underground drainage results in poor æration of the roots and in the dry zone in alkali salts being brought to the surface. In marshy fields in the higher elevations and in the wet low-country, underground drainage is essential.

SEED PADDY

Choice of Variety.—There are about 500–600 so called varieties of paddy grown in Ceylon. A single variety may be known by a different name in different districts, while on the other hand several varieties may be known by one name. Until the local varieties are classified it would not be possible to say whether the number of varieties or the number of names is the greater multiple of the product. Generally long-termed varieties yield more than short-termed varieties. Through trial and error particular varieties suited to particular districts are known ; but by cultivation for centuries without practising seed selection the suitable local varieties have degenerated through mixture and hybridization with inferior types. The obvious methods of improvement is to select in the field for seed purposes types possessing desirable characters. This method is known as mass selection and should be practised regularly by all cultivators where pure-line seed is not available. The direct method of improving a variety is by isolating individual strains and, while maintaining their intrinsic purity, testing them for high yield and other desirable characters. This method is known as pure-line selection. It requires specialised knowledge, is expensive and it may take 6 to 10 years to isolate a high-yielding strain. A list of pure-line selections isolated by this Department and recommended for particular areas appear in the appendix to Departmental Leaflet No. 199 and Food Production Leaflet No. 20.

Germinating Seed Paddy.—Generally freshly harvested paddy does not germinate satisfactorily unless it goes through a resting period. The short-termed varieties need a shorter resting period than the long-termed varieties.

This resting period could be reduced by subjecting the seed to a process of smoking. Many of the long-termed varieties of paddy and the coarser saline-resistant types possess hard outer glumes or husks. These varieties should be soaked for not less than 24 hours prior to germinating as compared to the 12 hours normally necessary. Most short-termed varieties germinate and are ready for sowing in 4–5 days. The long-termed varieties generally take 6–8 days, while some of the saline-resistant varieties may take as long as 8–10 days.

Seed Rate.—The seed rate in Ceylon varies from $1\frac{1}{2}$–5 or even 6 bushels per acre depending on the fertility of the soil, the duration of growth and the tillering capacity of the variety. The seed rate in the Balangoda district is the highest. Trials conducted for several seasons in that district indicate that even by the adoption of improved methods of cultivation the seed rate could not be reduced with the local variety but by the introduction of a suitable pure-line a reduction to as low as $2\frac{1}{2}$ bushels per acre was possible with better cultivation and manuring.

Sowing.—The fields should be drained just before sowing. Heavy rain within the first two days of sowing can cause considerable damage which could be minimised appreciably by impounding about an inch of water in the field. This layer of water acts as a buffer and prevents shifting of seed. The field should be drained off slowly after the heavy showers of rain.

IMPORTANCE OF THE CORRECT SEASON AND CORRECT TIME OF SOWING.

To ensure high yields it is essential that the different varieties of paddy are cultivated in the seasons best suited to them and that these are also sown at the correct time. Some varieties do well only in *maha* while others only in *yala*. Even though the same cultural conditions are provided they generally perform poorly or even fail in the wrong season. Delay of a fortnight or a month in sowing may result in reduced yields or failure of the crop. It is essential that sowing of different varieties in a tract be so timed as to ensure that the flowering phase of the different varieties synchronize and all varieties are ready for harvest about the same time. Failure to do so often results in the crop being damaged by rain at flowering and ripening, or by scarcity of irrigation water late in the season. Also pests, such as the paddy bug, stem-borer and birds are liable to cause serious damage to a crop which flowers and ripens earlier or later than the main crop in a tract.

In this emergency when a larger acreage has been brought under cultivation with an abnormally depleted labour force, delay in preparatory tillage and sowing has been inevitable. In many areas the situation is becoming grave as one season overlaps the other necessitating the abandonment of large areas or hurried cultivation resulting in low yields. Pests too are thus provided with a continuous supply of food throughout the year and increase in number. The only solution is to cultivate a considerably reduced acreage in the less important season so as to re-adjust sowing dates and commence cultivation at the proper time the following season. The enforced fallow thus provided would reflect in higher yields the following season and may even compensate any loss.

MANURING

If from the soil each season plant food is withdrawn and nothing returned this would result in reduction of yields and in poor quality produce. Hence manuring is essential.

Manures.—Organic manures are very important from the physical, chemical and biological points of view. The best response to artificial fertilizers are obtained only when an adequate supply of organic matter is present. Many Ceylon paddy soils are deficient in all the 3 principal plant nutrients—Nitrogen, Phosphoric acid and Potash. The quantities and proportions of these elements vary from tract to tract and even field to field. Generally, except in the low-lying swampy lands, 2–3 tons of green leaves, compost or well preserved cattle manure just before the first ploughing would supply the nitrogen requirements. It is essential that thereafter the fields should be kept flooded or thoroughly moist until sowing or transplanting. If any oil cake or mixtures containing an oil cake are available, 2–3 cwt. per acre is, in the writer's opinion, best applied half at final levelling and the remaining half as a top dressing a week after hand weeding or harrowing the crop; any smaller dressings should be supplemented by bulky organic manures. The phosphate requirements could be supplied by adding either ¾–1 cwt. of finely ground bone manure per acre after first ploughing or ¾–1 cwt. of artificial fertilizers such as superphosphate after final levelling.

Although Ceylon soils, with the exception of light soils, were not considered to be in need of potash manuring, yet recent observations seem to indicate that this constituent should be supplied in the form of manure to most soils. About 150 lb. of wood ash or 75 lb. of coconut husk or 28 lb. of potash fertilizer per acre, applied at final levelling, would be advantageous.

If the land could be drained and protected from cattle trespass a green manure crop raised from 60 lb. of sunn-hemp or 20 lb. of cowpea seed per acre and ploughed in just when flowering commences would be the most economical method of supplying organic matter.

In some peaty soils a dressing of about 10 cwt. of lime per acre once in about 3 years would be beneficial.

Season for Manuring.—It has been customary to manure fields both in the wet and dry zones during *maha*. But it has been found that in the dry zone the best season for manuring is *yala* for the following reasons: (i.) more green material is available at the commencement of the *yala* season, (ii.) few high-land crops are grown in *yala* and hence the cultivators are free to concentrate on their paddy fields, (iii.) there is little or no damage from heavy rain nor are manures washed away frequently as in *maha* and (iv.) intensity of sunlight in *yala* generally produces higher yields, other conditions being normal, although shorter-termed varieties are cultivated. This recommendation applies with greater effect to quick acting fertilizers such as nicifos &c.

Time of Applying Artificial Fertilizers.—The application of nitrogenous and potassic fertilizers, both in the wet and dry zones should be done, half at the time of sowing and the remaining half a week after hand weeding or harrowing the crop. If, however, weather conditions at sowing do not permit this the full quantity may be applied a week after weeding or harrowing.

Although in some of our trials no greater yield was generally obtained as a result of split or late application as compared with an application before sowing, yet probably because the varieties of paddy used were short duration a split or late application of nitrogenous and potassic fertilizers is recommended for the following reason :—

(1) Sowing operations are not delayed as will otherwise be the case when cultivators have to wait for 6 hours of fine weather for applying the manure before sowing.

(2) A delay of 6 hours before sowing after final levelling hardens the surface. This prevents the sprouted seed from sinking into the soft mud—an action essential for minimising damage by birds, preventing washaway by rain and encouraging the formation of a deep root system.

(3) As the standard of preparatory tillage is generally low and consequently weeds are not properly destroyed, the application of quick acting fertilizers before sowing would encourage weed growth which would adversely affect the crop. Also the manure would have been exhausted before the plants are old enough to utilize it, since in the early stages the plants subsist chiefly on the stored food in the seed.

The fact that nicifos failed to show any residual effects in our trials lend further support to this recommendation. Phosphatic manures, such as bone-meal, should be applied along with the bulky organic manures. As superphosphate is liable to be lost in irrigation water it should be applied at final levelling.

It may be of interest to note that in Bombay, China, Japan, Spain and Italy the general practice is split application of nitrogenous fertilizers.

WEEDS

The control of weeds in paddy fields in Ceylon is of vital importance as climatic conditions throughout the year favour weed growth and extensive methods of cultivation are in vogue owing to the shortage of both human and animal labour. In addition there is the delay in commencing cultivation owing to the necessity for flooding fields for buffalo mudding. Even in areas where implemental tillage is practised, the small narrow bunds are often burrowed through by crabs rendering the retention of water for decomposition and control of weeds difficult. Unless fields are ploughed several times and water impounded for a long period as in fields prepared for transplanting, weeds are not properly decomposed. This means that considerable weed growth develops in paddy fields soon after they are sown and an excess of irrigation water is required to inhibit their growth.

The three most troublesome weeds of paddy lands in Ceylon are : *kalanduru*, S., *Korai*, T., (*Cyperus rotandus*, L.), *Kuddamatta*, or *Muduhalpan*, S., (*Fimbristylis miliacea*, *Vahl.*), *Kokmotte*, S. (Eriocaulon sp.) and *Wel-marukku*, S., *Kolichchudan*, T., (*Echinochloa stagnina* and *Ecinochloa Crus-galli*). The technique of eradicating them, however, varies. The three former are best controlled by impounding about three inches of water and drawing a log over

a heavy plank such as a large levelling board across so as to press down both the paddy and the weeds when the crop is about three to four weeks old. In a day or two the paddy plants alone resume an erect position and the weed is destroyed if the same level of water is maintained for a week or so. With regard to *Welmarukku*, the most practical method of eradicating is to plough the fields as early as possible and impound water and retain for at least a fortnight so as to decompose the weed. The fields are then drained and this will cause the weed seeds to germinate in a few days. The normal preparation of the fields which should be done about a fort-night later will effectively destroy this growth.

This technique was successfully employed in completely eradicating the heavy infestations at Tissamaharama and Ambalantota Paddy Stations and the widespread infestation in the Kurunegala, Maho-Nikaweratiya districts. Another suggestion which has been made for eradicating this weed is to impound and maintain water for a week, then plough and churn the soil soon after and again impound and maintain about four to six inches of water for about three weeks.

General weeding of paddy fields, thinning and filling vacancies are necessary operations under conditions obtaining in Ceylon. The cost of this operation on an acre of average paddy land, in normal times, varies from Rs. 8 to Rs. 12 under present conditions the cost may range from Rs. 16 to Rs. 25 per acre. The adoption of hand weeding should result in an increase in yield of three to five bushels per acre and may not be economical under normal conditions. Inadequacy of labour in most paddy growing areas in Ceylon would not permit the adoption of this practice however much its desirability may be realized. The paddy crop develops fast. The various cultural operations should be performed expeditiously and within a very short period of time in the irrigable areas. For instance, weeding should be completed before tillering commences. In other words weeding must commence about three weeks from sowing and should be completed in a week to ten days. The futility of advocating the adoption of hand weeding as a general practice will therefore be seen. Even in thickly populated areas unless paddy sells at reasonably high level in normal times this operation is not economical. The solution to this important problem is then to find some practicable means by which weeding could be effected economically with the available human and animal labour.

The observation, that the disturbance caused to a paddy crop by some cattle trespassing in the field and the unsuccessful attempt of the field owners to secure them in order to claim compensation, actually resulted in a marked increase in yield, gave rise to the idea that stirring the soil, in a similar manner, would be of benefit. An account of the trials conducted in evolving the system of harrowing a growing crop and the technique prescribed are reported in an article entitled " The Effect of Harrowing A Growing Rice Crop " in the March 1940 issue of the *Tropical Agriculturist*. The technique in short is as follows : Impound about two to three inches of water when the crop is three to four weeks old. Harrow the crop with the wooden-toothed harrow drawn by buffaloes used in preparatory tillage. Narrow terraced fields and semi-marshy fields could be harrowed with a smaller hand harrow. Then lightly weed filling vacant patches with seedlings from thickly sown areas. Retain

about two inches of water for a week after which resume normal irrigation. The cost of this operation would vary with the rate of wages, hire of buffalo and the amount of weed growth. At normal times it varied from one to three rupees per acre.

The trials conducted at Batalagoda over a period of nine seasons beginning from *maha* 1939-40 indicate that irrespective of the age of a variety, or the method of cultivation, harrowing at a cost of 3-6 rupees per acre, depending on the increase in the rate of wages, gave increased yields ranging from 4-10 bushels per acre. Transplanting short-termed varieties was not economical and harrowing short-termed transplanted crops depressed yields as the plants had no time to recover from the two operations.

On a rough computation about one-third of the area in rice during *maha* is sown with long-termed varieties but transplanting is practised only in the Kandy and Kegalla Districts, where *attan* or the ancient system of communal or co-operative labour exists. During *yala* over four-fifths of the area is cultivated with short-termed varieties, sown broadcast, and even the long-termed varieties, grown in the rest of the area, are not transplanted as they are cultivated in swampy areas liable to frequent inundations or influx of high concentrations of salt water.

It will thus be seen that contrary to popular belief transplanting is feasible only in a very limited area under conditions prevailing in Ceylon. The operation of weeding, thinning and filling vacancies is expensive in the populous areas and impracticable in the larger sparsely populated districts. Available human and animal labour could be more economically utilized by the introduction of implemental tillage. The main cultural problem of paddy under conditions obtaining in Ceylon would be solved by the introduction of implemental tillage and by making weeding practicable. The solution to these problems lies in adopting the simple, practicable and most economical cultural operation known as " Harrowing the Growing Crop". It interferes with no established practice, need no elaborate equipment or out-lay, but it would certainly raise local production very considerably.

The importance of giving serious attention to the possibility of improving the cultivation of paddy on the lines indicated can hardly be over-emphasized. The development of the rice industry in Ceylon so as to meet local requirements would solve the most important and pressing problem of the Island and would, while retaining in this country a very considerable sum of money annually, greatly influence the prosperity of the other industries and consequently the general prosperity of the country.

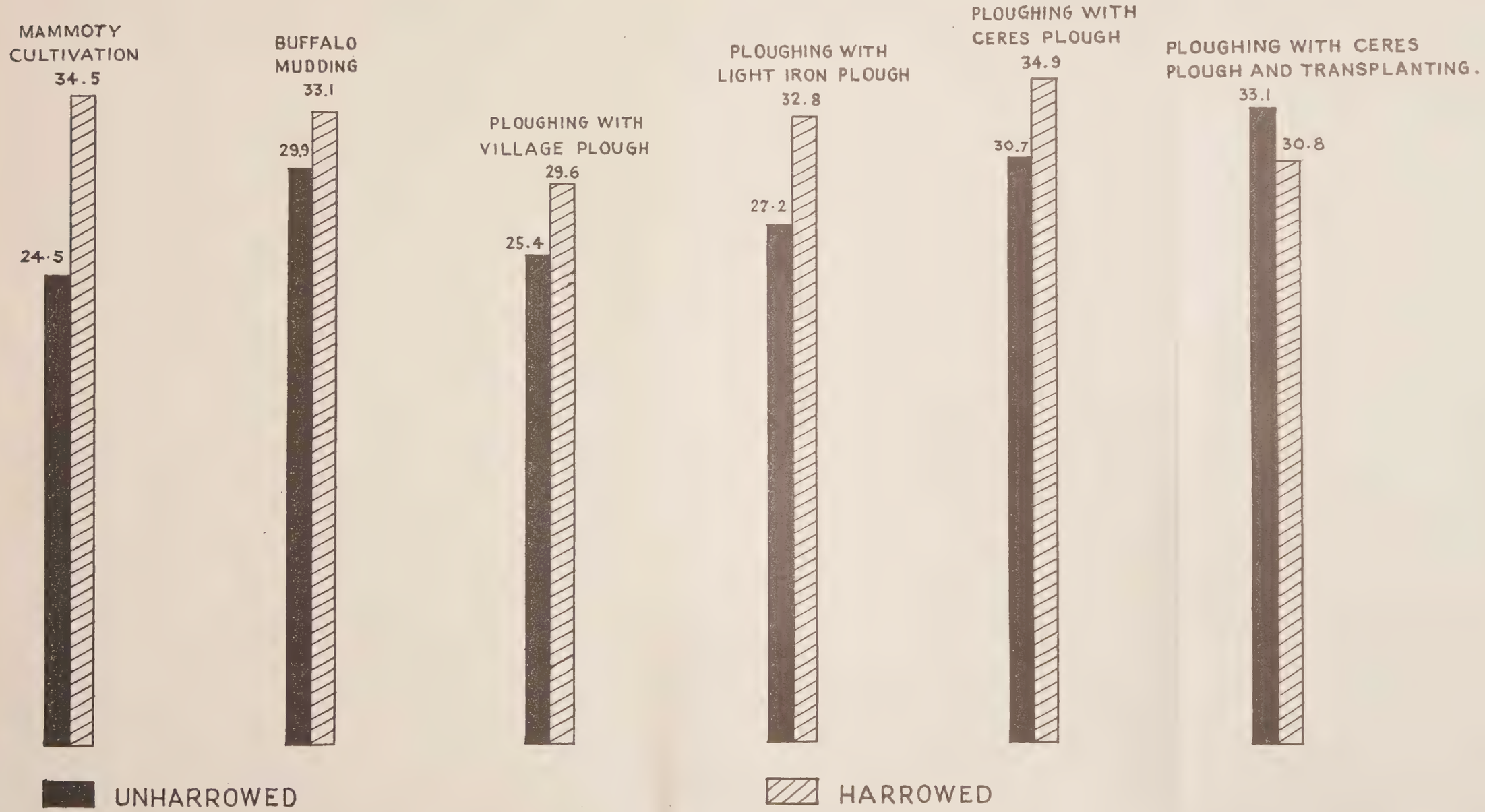
(A Paper read at the Inaugural Meeting of the Central Board of Agriculture held on 10th July 1944.)

PADDY DIVISION

RESULTS OF TRIALS CONDUCTED AT BATHALAGODA PADDY STATION FROM MAHA 1939-'40 TO MAHA 1943-'44

A COMPARISON OF THE DIFFERENT LOCAL SYSTEMS OF PADDY CULTIVATION AND EFFECTS OF HARROWING THE GROWING CROPS UNDER EACH SYSTEM

YIELDS OF PADDY IN BUSHELS PER ACRE



1. POORER THE STANDARD OF CULTIVATION, GREATER THE RESPONSE TO HARROWING THE GROWING CROP.
2. TRANSPLANTING OF A SHORT-TERMED CROP IS UNECONOMICAL; AND HARROWING A SHORT-TERMED TRANSPLANTED CROP DEPRESSES YIELDS.
3. HARROWING THE GROWING CROP IS THE MOST ECONOMICAL AND PRACTICAL METHOD OF WEED CONTROL.

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MEETINGS, CONFERENCES, &c.

REPORT OF THE PROCEEDINGS OF THE FOURTH MEETING OF THE CENTRAL BOARD OF AGRICULTURE HELD AT PERADENIYA IN THE BOARD ROOM OF THE DEPARTMENT OF AGRICULTURE AT 10.30 A.M. ON FRIDAY, FEBRUARY 16, 1945.

Present.—Mr. L. J. Senoviratne, C.C.S., Acting Director of Agriculture (Chairman); Mr. Marcus S. Rockwood; Mr. Wilmot A. Perera; Dr. W. R. C. Paul (Divisional Agricultural Officer, South-Western Division); Mr. T. A. Strong (Conservator of Forests); Mr. E. H. R. Tenison (Acting Commissioner for the Development of Agricultural Marketing); Mr. James P. Fernando; Mudaliyar K. Chinnatamby; Mr. A. E. Madawela Dissawa; Mr. T. B. Poholiadde Dissawa; Mr. S. Sivapalan; Mr. K. Kanakasabai; Gate Mudaliyar N. Wickremaratne; Mr. P. B. Bandaranayake; Gate Mudaliyar M. S. Kariapper; Mr. L. B. de Mel; Rev. Fr. L. W. Wickremasinghe; Mr. S. L. Bandara Dharmakirthi; Mr. R. H. Spencer-Schräder; Dr. M. F. Chandraratne (Acting Botanist); Mr. A. P. Weir (Acting Director of Irrigation); Mr. Malcolm Park (Acting Deputy Director of Agriculture); Mr. T. E. H. O'Brien (Director, Rubber Research Scheme); Mr. M. Atkinson; Dr. R. V. Norris (Director, Tea Research Institute); Mr. C. N. D. Jonklaas; Dr. A. W. R. Joachim (Chemist); Mr. A. R. T. Gibbon; Mr. A. T. Sydney Smith; Col. T. Y. Wright; Mr. R. T. Chelliah; Mr. F. A. E. Price; Sir J. P. Obeyesekera; Mr. R. H. de Mel; Mr. S. Pararajasingham; Mr. H. E. Jansz (Land Commissioner); Mr. A. R. Panditteseкera; Gate Mudaliyar S. Muttutamby; Mr. Bertram de Zylva.

The following visitors were also present:—Mr. L. L. Hunter (Additional Land Commissioner); Mr. A. V. Richards (Horticultural Officer); Mr. W. P. A. Cooke (Divisional Agricultural Officer, Killinochchi); Mr. S. F. Amerasinghe, Additional Land Commissioner (E); Dr. D. E. V. Koch (Assistant Chemist); and Mr. S. K. Thuraisingham (Divisional Agricultural Officer, Central Division).

Letters regretting inability to attend the meeting were received from the following members:—The Chairman of the Planters' Association; Mr. R. C. Kannangara, M.S.C.; Sir Wilfred de Soysa; The Registrar of Co-operative Societies; Mr. H. W. Amarasuriya, M.S.C.; Mr. A. G. Divitotawela; Mr. M. A. L. Kariapper; Mr. J. J. Heider; Mr. W. H. Attfield and Mr. U. B. Unamboowe.

MINUTES.

Minutes of the meeting held on November 24, 1944, having been circulated among the members, were taken as read and confirmed subject to four minor amendments.

Mr. S. Pararajasingham brought to the notice of the Board that in connection with the discussion of the motion on paddy Rev. Fr. Wickremasinghe stated that the L. C. P. A. opposed the motion brought up by him some years ago requesting that the price of paddy be fixed at Rs. 2 per bushel. The motion was opposed by Rev. Fr. Wickremasingha's brother, said Mr. Pararajasingham, and that the L. C. P. A. never opposed it in the sense as stated by Fr. Wickremasinghe.

Gate Mudaliyar N. Wickremaratne:—The Secretary of the L. C. P. A. who opposed it.

Mr. Pararajasingham read from a report appearing in the "Times of Ceylou" the names of the members who were present at that meeting.

Gate Mudaliyar M. S. Kariapper : May I know whether Rev. Fr. Wickremasinghe is to be held responsible for his brother's action ?

Dr. Norris : Mr. Gibbon raised the question of printing of the minutes at the last meeting.

Chairman : As a matter of fact we made every effort to get them printed. I am very sorry that the impression is not clear owing to the poor quality of the paper.

VOTE OF CONDOLENCE.

The Chairman : My next duty is a very sad one, that is, to move a vote of condolence on the death of Mudaliyar H. E. S. Wickremaratne. Strange, when I saw him last it did not occur to me that the necessity would arise to move this vote of condolence, because he seemed full of life and active in spite of his 60 years.

The vote of condolence was passed in the usual manner.

FUTURE PROCEDURE AS REGARDS NOTICE OF MOTIONS.

The Chairman : I wish to know the sense of the house as regards the resolutions on the agenda. I was thinking particularly of Mr. Gibbon's resolution, because it would affect all our future procedure. If this resolution were acceptable to the Board it would mean shortening the work of these meetings. Under the circumstances would the Board consider taking it first ?

The Board agreed to take up Mr. Gibbon's resolution, which was as follows :—

> "*That the mover of an original resolution should send in a copy of his remarks in support of his resolution for circulation to all members prior to the meeting in order to speed up the business before the Board.*"

The precis of Mr. Gibbon's arguments sent in advance in support of this resolution was as follows :—

> "At the inaugural meeting of the Board on the 10th July the agenda could not be finished and another meeting had to be called on 25th August. Again on 24th November the second meeting could not be finished and another meeting had to be called for 16th February.
>
> All members will agree that it is most undesirable that business should be held up like this. Members come from distant parts of the Island and they find that no consideration can be given to their proposals for lack of time. They return home feeling discouraged and disinclined to maintain a keen interest in the Board's activities.
>
> Ceylon must remain an agricultural country for many more years. If we are successfully to compete with other countries in the post war period, when competition will be fierce, the whole standard of agriculture in this Island must be raised. This needs a great deal of thinking and planning. All the best brains in Ceylon are needed for this purpose. The Central Board of Agriculture would become a more valuable advisory body if we could get on with our discussions more efficiently. This can only be done if we ourselves try to find a way out of the present impasse.
>
> Members must be brief in thier remarks and speak to the point. The Board is made up of educated and intelligent persons and it is not necessary to persue an argument at too great a length, since the Board can very soon make up its mind whether or not it agrees with what is said.
>
> If the suggested procedure fails to have the desired results it may mean having to adopt a number of rules to govern our debates. I suggest therefore that we try out the suggestion contained in the resolution first and avoid, if possible, rules which might prove embarrassing to the President to enforce.

Each member will be required to send in a concise precis of his arguments to the President whenever he wishes to bring forward an original resolution for discussion. A copy of the precis will be sent to each member of the Board and we shall be prepared in advance for the discussion, which will immediately follow the formal moving of the resolution by the member. The President will be able to study the argument in advance and so be in a better position to collect information and give advice during the discussion."

Speaking to his resolution Mr. Gibbon said : I do not think I need speak at length on the resolution as it stands in my name. I find that Mr. Kanakasabai and Gate Mudaliyar N. Wickremaratne have already sent in their remarks in support of their resolutions. I think that is the general opinion of the Board. If that is the general feeling of the meeting I have nothing more to say. I would ask my seconder to support the motion.

Mr. Wilmot A. Perera seconded.

Gate Mudaliyar M. S. Kariapper opposing the motion said that every matter that was brought up at that meeting should be thrashed out well and that they should be given an opportunity to discuss. He suggested that a full day (morning and afternoon sessions) should be devoted for the business of that Board. He felt that if they could not find the time they should not allow themselves to be elected as representatives of the farmer.

Gate Mudaliyar N. Wickremaratne in supporting the resolution said that there was no harm in sending in their remarks with their resolutions but that they must be given sufficient time for discussions.

Chairman : I do not think that Mr. Gibbon wants to restrict any discussions.

Dr. Norris : The main object is that if the members of the Board have previous information or a synopsis of the resolutions to be brought up for discussion they would fully undertand the basis of the suggestion. In that way we may have much time for useful discussion than to come here unprepared.

Mr. S. Sivapalan : Mr. Gibbon's proposal appears to be a very reasonable solution. Unless we have the notes of a motion in advance it would be practically impossible for us to get through the business.

Mr. Gibbon in reply said that there was no question of cutting down their discussions but that they would have more time for useful discussions.

The resolution was put to the house and carried unanimously.

ACTION TAKEN ON RESOLUTIONS ADOPTED BY THE BOARD.

Mr. Wilmot Perera : May I inquire whether you have anything to report on the previous resolutions adopted by this Board ?

The Chairman : I got the information with regard to paddy statistics with rather an apologetic note. I was wondering whether I should get them read out or get them cyclostyled and sent to members.

At the request of Mr. Wilmot Perera the Chairman gave the following summary of statistics of paddy land under cultivation :—

Yala 1943 total area cultivated 411,135 acres.
Maha 1943–44 area cultivated 646,944 acres.
Yala 1944 area cultivated 408,675 acres.

In reply to Mr. Wilmot Perera the Chairman said that the idea of fixing quotas was engaging the attention of the Land Commissioner.

Mr. S. F. Amerasinghe, Additional Land Commissioner (E) : We are working on these lines.

Mr. Wilmot Perera : Do the resolutions passed at this Board go up to the Minister ?

The Chairman : They do.

Mr. Wilmot Perera : What we want to know is what the Minister thinks about them.

The Chairman : The Minister does not tell us.

Mr. Perera : But could not this Board be made aware whether its discussions are communicated to the Ministry or what action the Minister proposes to take upon them ?

The Chairman : There is no statutory provision authorizing me to keep on asking what he thinks of the resolutions passed at this Board.

Mr. Perera : It seems unsatisfactory.

Mr. Gibbon : Could we get the Minister here and discuss the matters with him ?

The Chairman : The Minister is informed of these meetings. He has not been able to attend them, except one.

Mr. Gibbon : Alternatively, if the Minister is unable to attend himself, if he sends in a representative, we might be able to know the Ministry's point of view.

Gate Mudaliyar Wickremaratne : I do not think that the Minister could attend all these meetings. We cannot demand him to be present nor can we ask him to send a representative.

Mr. Perera : What we want to know is what is happening to these resolutions.

The Chairman : These resolutions are communicated to the members of the Executive Committee of Agriculture and Lands.

Mr. Perera : Might I ask you, as Chairman of this Board, to have this position clarified with the Minister ?

The Chairman undertook to do so.

As regards the non-attendance of the Minister and the other members of the State Council it was pointed out by the Chairman that very often the Council meetings clashed with the meetings of the Board.

Gate Mudaliyar M. S. Kariapper moved the following resolutions :—

(*a*) *That, as, until the Agricultural Department and the Irrigation Department are joined together in truly solemn and sincere wedlock, their joint baby, the paddy industry cannot enjoy a flourishing and self-reliant manhood, this Board is of opinion that steps should be taken to amalgamate both Departments as they are 95% in the paddy production job, in spite of their broad and, perhaps, inappropriate nomenclatures.*

(*b*) *That this Board is of opinion that the Central Government should take immediate practical action towards the achievement of the farmers' "Four Freedoms" to wit, freedom from want of irrigation water, freedom from want of economic prices, freedom from want of cheap credit facilities and freedom from want of knowledge of scientific cultivation methods, and that this Board should be kept advised from time to time of action taken to achieve these results.*

Speaking at length on the two motions he said that if they succeeded in achieving the "Four Freedoms" enumerated in resolution (*b*), he had no doubt that before long they need not look to Burma or go to Australia for their food supplies. Referring to the work done by the Department of Agriculture Mudaliyar Kariapper said that though the Department had been in existence for two generations still paddy interests were confined to a minor sub-section of its activities. As an example he pointed out that a very useful magazine like the Tropical Agriculturist devoted very little space in regard to paddy. He deplored the fact that in the Central Board of Agriculture, which had 60 members and a larger body than the State Council, the Paddy Officer found no place. He stated that the paddy cultivator was suffering from an inferiority complex and requested the Director of Agriculture to instruct his officers to cure it.

Mudaliyar Kariapper referred to a newspaper article in which it was stated that the Minister proposed to tractor-plough an area of 3,000 acres of paddy land in Kalmunai district but that the people refused. The proposal was dropped because the people demanded exorbitant ground-rent. He said that that was news to him and to the other residents of the district. He inquired if it was correct that the information was supplied by an officer of the Department of Agriculture.

The Chairman : So far as I am aware that information was not supplied by this department nor by the Divisional Agricultural Officer.

The Irrigation Department in Ceylon, Mudaliyar Kariapper said was not concerned with irrigation for cotton or jute as in other countries but was 100 per cent. in the paddy production ; and should intimately and exclusively be connected with the Department of Agriculture in the matter of paddy cultivation. But the two Departments were not behaving even like distant cousins, and to bring them together was like getting together an elephant and a horse. He invited the attention of the Irrigation Department to investigate whether Mr. Taylor's slogan " If a cultivator approaches you for assistance, don't say ' No '. Try if you can possibly say " Yes ", was followed up.

Continuing he said that the food situation of the Island was as much a challenge to the 125 years of British administration as it was to the self-respect of every Ceylonese. Time was, he said, that the King himself was the Head of Agriculture in the Island and had his headquarters in the dry zone, but today they had the bulk of the population and the bulk of the wealth collected in the wet zone. Perhaps in another century of intensive cultivation he said that even the very rivers of the Island would have ceased to flow.

He did not know whether he was hoping against hope, said Mudaliyar Kariapper, that the Director of Agriculture would take the example of the Kings of old and shift his headquarters to the dry zone, as he felt that the combined services of agriculture and irrigation would be better located there owing to the important relation they bore to food cultivation. Ceylonese were losing their characteristics he said, and that no nation which broke away from the soil in which it was born could hope to retain its distinctive characteristics.

Mudaliyar Kariapper then paid a tribute to the Minister and said that if there was one man today who was doing something for the welfare of the farmer it was Hon. Mr. D. S. Senanayake. He conceded that the only objection to his motion was that both departments were under the same Minister who could co-ordinate their work. Under the present Minister they might perhaps remain so but what would happen if a less forceful man became the Minister inquired Mudaliyar Kariapper. Concluding he said that from a national point of view the amalgamation of the two departments was a far-sighted policy and that he moved the resolutions in the best interests of the paddy industry which was languishing because it could not subsist on a diet of lip service which was all it had got hitherto.

Gate Mudaliyar N. Wickremaratne in seconding the resolution said : I think it is worthy of consideration. Just now the Veterinary Department has been amalgamated in the Department of Agriculture and I think they are able to do much better than what they did before. Irrigation Department is required for the cultivation of paddy and from what I see recently the attitude of the Director of Irrigation is moving away from the question of irrigation. I read his report with great concern about dry farming. He is there to make water available to the Department of Agriculture. Instead of that I find that he is going on with dry cultivation and mechanized cultivation. The Irrigation Department must be concerned with its work, that is storing water and building anicuts to be available for paddy cultivation. Therefore, I think, that Head should also be brought under the Director of Agriculture. I think it is very necessary that the Irrigation Department should be amalgamated with the Department of Agriculture. I have very great pleasure in seconding the motion to amalgamate the two departments.

Mr. A. P. Weir, Acting Director of Irrigation, opposing the resolution said : The Mudaliyar suggests that the amalgamation of two of the specialist Departments under the Ministry for Agriculture and Lands—Departments which implement the policy laid down by the Executive Committee of that Ministry would increase paddy cultivation. Before he amplified his motion, I thought he proposed that every Agricultural Instructor should endeavour to become a professional engineer and that every highly trained Hydraulic Engineer should also take a course in Botany or Animal Husbandry but he means that these two departments should have a common Administrative Head—an officer who can one day be administering the Agricultural Department from Peradeniya and the next day the Irrigation Department from Colombo.

There is no doubt that such an individual might be found, but when he went completely mad there would doubtless be practical difficulties in the way of training his successor-in-office to perform with commendable efficiency such multifarious duties.

In this age of specialization, the tendency is for Departments of Government in common with other bodies, to confine their activities to work for which they have special aptitude.

Would Mudaliyar Kariapper himself expect to have his teeth extracted by the same Surgeon to whom he would entrust the removal of his appendix or would he expect the motor firm who re-paints his car to re-build his tyres ?

Then why should he expect that the Agricultural Department can be successfully administered by the Irrigation Department ? It is but natural that the Administrative Head of the Irrigation Department would subjugate the interests of the Department of Agriculture to that of Irrigation whenever the interests conflicted.

The members of this Board can well imagine the cumbersome nature which the administration would assume if Departments were haphazardly amlagamated. And why stop at the Agricultural Department ? Invoved in the cultivation of paddy are also the Forest Department, the Land Settlement Department, and the Civil Defence Commissioner as well as the Emergency Government Agents. Why not amalgamate all these and have one glorious hotch-potch ?

But perhaps the Mudaliyar refers to what he considers to be lack of co-ordination of policy. If this is the case, why does he wrap up his accusation with garbled phrases ? If he intends to attack the policy of the Executive Committee for Agriculture and Lands then his motion is completely outside my province but I must in fairness say as one who has been instrumental in implementing this policy in so far as the Irrigation Department is concerned, that this policy is clearly defined and that successive steps are being taken in accordance with long-term planning of that Committee.

Mr. K. Kanakasabai in opposing the resolution said that the present arrangements for control and management of cultivation was not vested in the hands of scientific authority but with the people who had no scientific knowledge of the subject, and what they required was necessary legislation because the Irrigation Department was not vested with sufficient power, and it would be useless considering the question of amalgamation until legislation was found out.

Mr. R. T. Chelliah speaking in support of the motion said that the Irrigation Department was interfering and upsetting the plans of the Department of Agriculture. Tanks in the Eastern Province had been neglected. Further north the Giant's Tank was virtually a ruin for lack of attention. In the case of the Iranamadu Scheme the Department of Agriculture had no voice except for the Soil Chemist. The whole Scheme was in a mess and he blamed the Minister of Agriculture for not considering it fully. He stated that it was best that instead of the Director of Irrigation the Director of Agriculture should visit places like India and Australia to study paddy cultivation. For systematic and smooth running of both departments he supported the resolution.

Mr. S. Sivapalan said that if it was the idea to increase the interests of the paddy cultivator it was necessary that both departments should be amalgamated. In his opinion, he said that centralizing was good in the interests of paddy cultivation. To advance the interests more intensive work was required from both departments. As far as Trincomalee district was concerned he said that they had not proved to the cultivator by scientific methods of cultivation to get a better yield. If that was done they should consider that they had done a service to the country. Better yield was possible by scientific methods. Since the Department was started the progress in their district had been slow.

Continuing he said that he did not agree with the encomiums paid to the Hon. the Minister by Gate Mudaliyar Kariapper. If he had had any grievance against anybody it was against that person. He alluded the failure of Trincomalee district's 60,000 residents to be self-sufficient to the failure on the part of the Minister to co-ordinate the activities of the two departments.

Mr. F. A. E. Price remarked that in order to increase the production of paddy which is of vital importance, it was not amalgamation but co-ordination of agriculture and irrigation that should be kept in view.

Mr. Wilmot Perera : If there has been a lack of co-ordination it is surely the fault of the Minister.

Mr. L. B. de Mel said : In the ordinary course of business we have seen that some minor officers of the two departments blaming each other. If the two departments are put under one Head most of these difficulties could be obviated. If there was any legal difficulty we we should ask for legislation now.

Mr. H. E. Jansz, Land Commissioner, said that members of that Board did not seem to be aware that machinery already existed for co-ordinating the work of the two departments, consisting of heads of departments under the Minister of Agriculture. It was only after this body formulated a co-ordinated plan that agricultural activities were commenced.

Mr. Marcus Rockwood suggested the addition of freedom from want of transport to Mudaliyar Kariapper's resolution.

Mr. Sydney Smith said that even in England the two departments were separate entities which functioned separately under one Minister, and what was needed was more co-ordination and co-operation.

The resolutions being put to the house were lost—voting being 10 in favour and 19 against.

The following motion of Gate Mudaliyar N. Wickremaratne was withdrawn by him since the Chairman stated that he had already asked for those figures to be obtained during the coming Census.

> "*For the improvement of Food Production and village agriculture cattle are a very essential factor and this Board requests the Government to cause to take a census of cattle in the Island making special mention of the number of plough cattle (buffaloes and neat cattle) available for the purpose of ploughing.*

Mr. M. Atkinson moved the following resolutions, which he said were the views of the various Planters' Associations :—

> (*a*) *That a request should be made to Government to consider applications from estates for portions of such land in areas below 3,000 ft. to meet their requirements under the Food Production Ordinance.*

Mr. Atkinson formally moved the resolution and requested that Government should entertain applications from Estates in order to comply with the requirements of the Food Production Ordinance.

Mr. H. E. Jansz, Land Commissioner, said that many estates have made applications and have been given land for cultivation for the duration of the emergency period.

(*b*) *That a request be made to Government that the large quantities of manure lying about the country if not required by Government Food Production Schemes should be made available to estates.*

Mr. S. Sivapalan pointed out that manure was decaying in sheds along roadsides in Trincomalee district.

Mr. S. F. Amerasinghe, Additional Land Commissioner (E) : They are stocks of manure which have not been used. It is not known whether all that manure is yet unfit for use. We are doing what we could to induce the villagers to use the manure, and if they did not want them we would be giving them to other Government Departments.

In reply to Mr. A. R. T. Gibbon, Mr. Amerasinghe said that the manure left all over the Island was about 4,000 tons. Of this amount the Director of Agriculture would be taking 1,000 tons.

Poholiyadde Dissawa : The manure that is left over has not become useless yet. It will take some time for people who have not used manure before to realize the value of it. He requested that the manure should not be removed for some time from the places where they were stored at present.

In reply to Mr. A. R. T. Gibbon, Mr. Amerasinghe said that the manure available was the ground-nut and saphos mixture.

Mr. L. B. de Mel said that some cultivators in the Eastern Province did not want the ground-nut and saphos manure as it proved to be unsatisfactory.

Dr. A. W. R. Joachim, Chemist, said that so far as he could say that the mixture had been used for the last four seasons in the Departmental farms and that they were keen in having them. If only one would go to Nikaweratiya, he said, the results could be seen.

Gate Mudaliyar Wickremaratne agreed with Dr. Joachim that the manure used was very successful, provided the manure was applied 10 days before sowing, but what some cultivators did was to sow the manure with the seed.

(*c*) *That Government be approached to undertake the distribution of such foodstuffs to areas where they are not available by arranging that lorries which bring goods from Colombo should load such crops on their return journeys.*

Mr. Atkinson said that the idea came from up-country planters who grew food crops.

Mr. H. E. Jansz, Land Commissioner, suggested that application be made to the Rubber Controller for the necessary lorries.

(*d*) *That as large numbers of pigs are reared on waste food in and around aerodromes this should be adopted in all large camps.*

Mr. Atkinson said that the resolution was brought up more or less as propaganda rather than as a resolution.

Sir J. P. Obeyesekera : Are these pigs kept under enclosures or are they allowed to roam about ?

Mr. Atkinson : They are kept under enclosures.

The resolutions were accepted by the Board.

(*e*) *That an aerial photographic survey of the Island should be made on the lines suggested by Mr. Malcolm Park at the meeting held on the 4th October, 1943.*

Mr. Malcolm Park : My suggestion was made with regard to agricultural statistics in Ceylon. We all appreciate how handicapped we are for want of these statistics. It is possible for the Imperial Services to assess accurately areas under crops like paddy. It is easily seen from aeroplanes. If a number of aeroplanes is available in Ceylon it might be possible for the Royal Air Force to undertake this partly to give them practice and partly for our benefit. We may be able to take aerial photographs taken at the appropriate time during the cultivation season, when it would be possible to assess the actual area under cultivation. Since the question was discussed last it is understood that the Secretary of State for the Colonies had started a Central Imperial Survey Unit. It is most desirable that we should make use of the aerolpanes which we got in Ceylon now, concluded Mr. Malcolm Park.

Mr. T. A. Strong, Conservator of Forests, said that he had discussed that question of aerial photography with an Officer of the Air Force but he was told that planes suitable for the purpose were not available.

The Board decided that an aerial photographic survey of the Island be undertaken as soon as conditions permit for the purpose of obtaining agricultural statistics.

Gate Mudaliyar N. Wickremaratne moved the following resolutions :

(a) " *That it is the opinion of this Board that the cotton industry in this country should be encouraged in a more comprehensive manner and that this industry should receive very careful consideration in any post-war economic planning by Government of Ceylon.*"

In support of which he had sent in advance the following precis :—

" Cloth comes next to food in the economic wants of man. In the Tropics the most important material with which cloth is made of is cotton, which is being grown in Ceylon. The old type of cotton grown in this country is the type known as Kidney cotton. This type of cotton was found to be unfit for ginning. Early in the regime of Sir Henry Blake better varieties of cotton were introduced.

The efforts to introduce a better type of cotton did not at first meet with success. In 1910 some experimental plots in the Hambantota District proved successful and cotton grown in Tissa was sent to England and was reported on as good. In 1912 land was selected at Ambalantota for further trials and as these trials proved successful cotton growing came to be established in this district.

It is being grown as a chena crop by the villager and considerable sums of money are being earned by him in this way. But this method of cultivation has its limits and the time has now come to take up the growing of cotton more seriously.

The drawback to the development of the cotton industry is the want of facilities for ginning and spinning of cotton in Ceylon, as the Wellawatta Spinning Mills, owned by a foreign firm, does not cater for our needs. Mechanized agriculture can be used to bring a large area under cotton cultivation and spinning and weaving mills should be established. There are hundreds of handlooms in need of cotton yarn and the handloom industry cannot progress without cotton yarn. This question should receive the attention of the Ministries of Agriculture and Lands and Commerce and Industries.

The Department of Agriculture should make a start to bring under cultivation a larger area especially as the latest trials by the Department have proved successful in evolving a long stapled variety of cotton in this country ".

Gate Mudaliyar Wickremaratne in moving the resolution said that the chief reason for bringing that resolution was the scarcity of cloth and the possibility of growing more cotton in this country. Experiments during the last 7 or 8 years have shown that cotton could be grown not only as an economic crop but also as a profitable crop. He then traced the history of cotton growing in Ceylon.

3——J N A 51963 (7/45)

Gate Mudaliyar M. S. Kariapper seconded the resolution.

Colonel T. Y. Wright said that the results of the experiments he had tried in growing cotton were satisfactory but it was expensive.

Mr. Spencer-Schrader : Cotton seed is very badly needed for cattle food.

Dr. M. F. Chandraratne said that recently the Department had been doing quite a lot for cotton growing. They had tested nearly 20 varieties and at least 5 of them gave yields of 7½ cwt. per acre, which is considered to be good. The long stapled variety which gave a better yield had no market. Hitherto the cotton grown had been supplied to the Wellawatta Mills which had reported that the staple lengths were much too long for their purpose as they did not possess the necessary machinery for them. In order to make cotton growing in Ceylon profitable and an economic concern he said that it should be extensively grown and that the present day mammoty should be replaced by better implements. They should also get away from the present method of growing it as a chena crop and resort to a rotational system of arable farming when it would be a success.

Mr. H. E. Jansz, Land Commissioner : May I ask Dr. Chandraratne whether the yield of 7½ cwt. per acre was from one block.

Dr. Chandraratne : We do labour under this handicap of limited acreages and these yields are based on figures obtained from one to half acre blocks.

Mr. Wilmot Perera : I raised this question at the time of Dr. Youngman. Undoubtedly if we are to improve our handloom industry we ought to have our own raw material.

In reply to Mr. Gibbon, Mr. Malcolm Park explained how cotton could be grown as a rotational crop.

Gate Mudaliyar Wickremaratne in reply said that even if the yield was 5 cwt. per acre it was worth tyring the cultivation. He suggested that cotton should be cultivated on high land and that the fields should be left for paddy cultivation.

As regards transport difficulties he said that it could be overcome by ginning the cotton at the spot.

The resolution was accepted by the Board.

Before moving the following resolution Gate Mudaliyar Wickremaratne requested the deletion of the words " before such schemes are actually launched " at the end of the resolution.

The Board agreed.

(b) " *That in view of the interest shown by a number of members of this Board in the matter of mechanized farming that this Board considers the appointment of a competent Committee or Sub-Committee of this Board to report on the project and how such mechanism will help the thousands and thousands of small paddy cultivators in the rural areas of this country to develop their cultivations as a real necessity.*"

The following precis sent by the mover in support of his motion had been circulated among the members :—

" Recently there has been much discussion by this Board regarding mechanized agriculture. Rosy coloured schemes were discussed and passed in spite of adverse comments by those in authority. The traditional method of cultivation by villagers had been severely criticized. There is no doubt that agricultural machinery is of some use in certain districts in the opening of new lands and certain other works. But I definitely say that there is very little hope of paddy cultivation under mechanized agriculture or dry farming in this country, and when people condemn the expenditure on restoration of ancient tanks as wastage of money I think we have to investigate the proposed methods of mechanized agriculture and how it would help the existing lands under cultivation.

The other day the opinion of this Board was that the village tanks in the Island should be restored so as to increase the food production in the village but the Director of Irrigation opposed the motion. I do not know the reason but I do know that he wrote an elaborate report on dry cultivation in another country giving the size of a field as 70 acres or so. Is he under the impression that all the existing 7 or 8 lakhs of acres of paddy lands can be turned into Australian method of cultivation ? My object in submitting this resolution is to ask those who advocate wholesale mechanized agriculture to show how their recommendation will assist the existing paddy lands scattered all over the Island. For this reason I would strongly recommend that the opinion of a group of agriculturists selected by the Board or by Government should go into this matter and report."

After a short discussion the resolution was passed by the Board, three members voting against, and the following sub-committee was appointed :—

Gate Mudaliyar N. Wickremaratne,
Sir J. P. Obeyesekera,
The Director of Agriculture)
The Director of Irrigation, } or representative
The Land Commissioner,)
Mr. M. Atkinson,
T. B. Poholiyadde Dissawa and
Mr. R. T. Chelliah

At the request of Mr. A. R. T. Gibbon the Chairman undertook to arrange, after giving a week's notice, to show the members of the Board a tractor demonstration.

Gate Mudaliyar N. Wickremaratne referred to an advertisement in the local press by the Civil Defence Commissioner calling for applications for posts of Cattle Purchasing Officers. He said if some undesirable men were appointed to such posts they would go into the villages and get hold of cattle and sell them, in spite of so many restrictions regarding the sale of cattle.

The Chairman undertook to inquire from the Civil Defence Commissioner on what conditions those officers were appointed.

With the approval of Mr. K. Kanakasabai discussion on the following motion was postponed for the next meeting :—

"*That, whereas the scarcity of food and labour has caused considerable hardship on indigent farmers under very many of the village tanks and consequently, they are being unable to carry on the annual earth-work maintenance of tanks and repairs to masonry structures and flood damages, without the necessary assistance of Government, this Board urges the need for appointing experienced and senior Village Tank Inspectors in important tank districts such as those in the Northern, North-Western, North-Central, Southern and Eastern Provinces, with a view to promote the advancement of paddy cultivation during the emergency food production period.*"

In the absence of Sir T. B. Panabokke discussion on the following resolution sent in by him was postponed for the next meeting :—

"*That repairs and improvements to village irrigation works should be undertaken by Government without limiting the expenditure strictly to Rs. 80 per irrigable acre of paddy land . . . . at least while the present emergency lasts, if not for all time.*"

NEXT MEETING.

The next meeting was fixed for May 21, 1945, at 10.30 A.M.

The meeting concluded at 1.30 P.M. with a vote of thanks to the Chair.

M. J. PERERA,
Secretary, Central Board of Agriculture

Peradeniya, April 3, 1945.

RUBBER RESEARCH SCHEME (CEYLON).

MINUTES OF THE SEVENTY-FOURTH MEETING OF THE RUBBER RESEARCH BOARD HELD AT THE SECRETARIAT, COLOMBO, AT 2.30 P.M., ON MONDAY, MARCH 12, 1945.

Present.—Mr. L. J. de S. Seneviratne, C.C.S. (in the Chair), Col. C. J. D. Lanktree, C.C.S. (Acting Deputy Financial Secretary), Mr. T. Amarasuriya, M.S.C., Mr. G. W. Aldridge, Mr. W. H. Attfield, Mr. W. N. de Alwis, The Hon. Mr. G. E. de Silva, M.S.C., Mr. W. P. H Dias, J.P., Mr. W. N. Gunawardena, J.P., Mr. R. C. Kannangara, M.S.C., Mr. F. A. Obeysekere, Mr. J. L. D. Peiris, and Mr. G. R. Whitby, M.S.C.

Mr. T. E. H. O'Brien, Director, and Sir Clifford Figg were present by invitation.

Apologies for absence were received from Messrs. L. P. Gapp and E. W. Whitelaw.

The Chairman welcomed Sir Clifford Figg to the meeting.

1. MINUTES

(*a*) *Confirmation.*—Draft minutes of the meeting held on December 18, 1944, which had been circulated to members, were confirmed and signed by the Chairman.

(*b*) *Matters arising from the minutes :*

Appointment of a Mycologist.—Correspondence with the London Advisory Committee regarding the recruitment of a Mycologist was reported. Members were in entire agreement with the views expressed in the Director's memorandum regarding the immediate need for a Mycologist. Sir Clifford Figg agreed that the scheme should have a first class Mycologist. Arrangements for advertising the post and method of selection were agreed on.

In connection with the proposals for future development Sir Clifford Figg gave a short account of the formation and work of the Rubber Study Group and his views on the long-term prospects of the plantation Rubber Industry.

The Chairman thanked Sir Clifford for having attended the meeting and for giving the Board the benefit of his views. Sir Clifford then left the meeting.

2. DECISION BY CIRCULATION OF PAPERS

Proposals for future development.—Reported that the proposals for future development as approved by the Board had been circulated to members. No adverse comments had been received and the proposals were now being printed as a special circular.

3. BOARD

Reported that :—

(*a*) Mr. S. F. H. Perera had resigned on December 23, 1944, and Mr. W. N. de Alwis had been nominated in his place by the Low Country Products Association with effect from February 24, 1945.

(*b*) Col. C. J. D. Lanktree, Acting Deputy Financial Secretary, had been deputed to represent the Financial Secretary with effect from February 8, 1945, in place of Mr. C. E. Jones.

(c) Mr. R. C. L. Notley had left the Island and Mr. G. W. Aldridge had been nominated by the Planters' Association of Ceylon to act for him with effect from February 22, 1945.

The new members were welcomed to the Board and the retiring members thanked for their services. Special reference was made to the valuable services rendered by Mr. C. E. Jones during his long period of membership.

4. EXPERIMENTAL COMMITTEE

(a) *Membership.*—Agreed that Mr. W. N. Gunewardena should act for Mr. R. C. L Notley as a member of the Experimental Committee.

(b) *Recommendations made at meeting held on January 15, 1945*—

(1) *Accommodation for graduate assistants.*—Agreed that a chummery be constructed on the basis of an architect's plan.

(2) *Visiting Agent's report*—was adopted.

(3) *Boiler.*—Purchase of a small boiler for experimental use, and a polariscope, was approved.

(4) *Partitioning factory verandah.*—A revised estimate for partitioning the factory verandah was approved and the necessary financial provision made.

The minutes were adopted subject to the above comments.

5. ACCOUNTS

(a) Dartonfield, Nivitigalakele and Hedigalla accounts for October and November, 1944, were tabled.

(b) *Fixed deposits and investments.*—Reported :

(1) Transfer of two fixed deposits of Rs. 35,000 and Rs. 50,000 to current account.

(2) Renewal of a fixed deposit of Rs. 30,000.

(3) Investment of Rs. 5,000 in 3 per cent. National Loan 1954 and Rs. 82,400 in 3¼ per cent. Ceylon Government Loan 1949–51.

(c) *Supplementary votes.*—Supplementary votes for 1944 totalling Es. 21,481 on Revenue Account and Rs. 1,862 on Capital Account were passed.

6. STAFF—

(a) Proposals for overseas leave for three senior officers in 1945–46 were approved.

(b) *Junior Staff.*—The following appointments were reported :—

(1) Mr. D. M. Rodrigo as Computor from March 1, 1945.

(2) Messrs. W. V. Fernando and T. B. Dissanayake as Rubber Instructors from March 8, 1945.

7. PUBLICATIONS

The following publications were tabled :—

Annual Report for 1943.
2 Supplements to Advisory Circular No. 22.
Advisory Circulars Nos. 23 and 24.

8. DIRECTOR'S REPORT FOR THE 4TH QUARTER, 1944—was adopted.

The meeting then terminated.

4——J. N. A 51963 (7/45)

ANIMAL DISEASE RETURN FOR THE MONTH ENDED JANUARY 31, 1945

Province, &c.	Disease	No. of Cases up to date since Jan. 1, 1945	Fresh Cases	Deaths	Recoveries	Balance Ill	No. shot
Western Province	Rinderpest	34	54	17	15	2	—
	Foot-and-mouth	10	10	—	—	10	—
Colombo Municipal Council	Rinderpest	66	66	46	20	—	—
	Rabies	3	3	3	—	—	—
Colombo Municipal Quarantine Station	Rinderpest	180	180	180	—	—	—
	Anthrax	38	38	38	—	—	—
Southern Province	Haemorrhagic Septicaemia	10	10	10			
Northern Province	Rinderpest	93	93	81			12
North-Western Province	Rinderpest	152	152	100	13	32	7
Central Province	Anthrax	14	14	14			

T. M. Z. MAHAMOOTH.
Acting Deputy Director (Animal Husbandry), and
Government Veterinary Surgeon.

Peradeniya, June 5, 1945.

ANIMAL DISEASE RETURN FOR THE MONTH ENDED FEBRUARY 28, 1945

Province, &c.	Disease	No. of Cases up to date since Jan. 1, 1945	Fresh Cases	Deaths	Recoveries	Balance Ill	No. shot
Western Province	Rinderpest	88	54	42	44	1	1
	Foot-and-mouth	10	—	—	10	—	—
Colombo Municipality	Rinderpest	93	27	54	39	—	—
	Rabies	4	1	4	—	—	—
Colombo Municipal Quarantine Station	Rinderpest	185	5	185	—	—	—
	Anthrax	47	9	47	—	—	—
Southern Province	Hæmorrhagic Septicæmia	10	—	10	—	—	—
Northern Province	Rinderpest	251	158	219	—	5	27
North-Western Province	Rinderpest	192	40	132	18	33	9
Central Province	Anthrax	23	9	23	—	—	—
	Black quarter	8	8	8	—	—	—

T. M. Z. MAHAMOOTH,
Acting Deputy Director (Animal Husbandry) and
Government Veterinary Surgeon.

Peradeniya, June 6, 1945.

ANIMAL DISEASE RETURN FOR THE MONTH ENDED MARCH 31, 1945

Province, &c.	Disease	No. of Cases up to date since Jan. 1, 1945	Fresh Cases	Deaths	Recoveries	Balance Ill	No. shot
Western Province	Rinderpest	95	7	44	45	5	1
	Foot-and-mouth	10	—	—	10	—	—
Colombo Municipality	Rinderpest	117	24	62	55	—	—
	Rabies	9	5	9	—	—	—
Colombo Municipal Quarantine Station	Rinderpest	406	221	406	—	—	—
	Anthrax	75	28	75	—	—	—
Southern Province	Hæmorrhagic Septiceamia	10		10			
Northern Province	Rinderpest	324	73	292	—	5	27
North-Western Province	Rinderpest	192	40	132	18	33	9
Central Province	Anthrax	23	—	23	—	—	—
	Blackquarter	12	4	12	—	—	—
	Foot-and-mouth	36	36	1	1	34	—

T. M. Z. MAHAMOOTH,
Acting Deputy Director (Animal Husbandry) and
Government Veterinary Surgeon.

Peradeniya, June 6, 1945.

METEOROLOGICAL REPORT, JANUARY, 1945.

STATION	TEMPERATURE				HUMIDITY		Amount of Cloud	RAINFALL		
	Mean Maximum	Difference from Average	Mean Minimum	Difference from Average	Day	Night (from Minimum)		Amount	No. of Rainy Days	Difference from Average
	°	°	°	°	%	%		Ins.		Ins.
Agalawatta	89·6	+1·5	68·1	—2·6	76	97	4·8	2·93	7	—
Anuradhapura	84·8	+1·6	66·9	—2·4	73	92	4·2	0·24	4	— 5·56
Badulla	77·4	+1·0	61·2	—2·5	75	91	4·2	0·46	4	— 9·86
Batticaloa	81·9	+0·4	71·0	—2·7	78	90	5·0	0·17	3	—12·71
Colombo	87·6	+1·2	69·9	—2·0	68	87	3·6	0·01	1	— 3·95
Diyatalawa	74·3	+2·4	54·1	—3·4	72	90	5·7	0·30	6	— 6·34
Galle	83·5	—0·5	72·7	—0·2	80	90	4·6	0·11	1	— 3·77
Hakgala	69·8	+2·9	48·1	—3·5	71	83	6·7	0·80	3	—11·63
Hambantota	85·4	+0·4	70·8	—1·9	74	87	4·0	0·12	2	— 3·88
Jaffna	83·7	+0·7	70·5	—1·7	74	87	3·2	1·70	2	— 2·71
Kandy	85·9	+2·4	63·9	—3·3	70	89	4·7	0·24	2	— 6·10
Kurunegala	87·7	+1·2	67·9	—1·9	66	90	3·2	0·06	2	— 5·05
Lunuwila	88·4	+0·6	68·4	—2·7	71	95	4·8	0·02	1	— 3·57
Mannar	83·4	—0·1	72·1	—2·1	74	88	3·6	0·65	3	— 3·19
Nuwara Eliya	70·0	+2·3	42·4	—4·2	64	77	4·2	0·15	3	— 6·81
Puttalam	85·9	+0·3	67·5	—2·6	74	92	3·8	0	0	— 3·43
Ratnapura	91·4	+2·1	69·4	—1·7	70	80	5·0	5·19	5	— 1·07
Talawakele	76·2	+2·1	50·5	—5·2	60	73	4·2	0·08	2	— 3·79
Trincomalee	80·8	+0·2	73·9	—1·3	76	81	4·8	0·60	4	— 7·71

Drought conditions in January were unprecedented. Monthly totals had to be reckoned in fractions of an inch at stations which normally received five to fifteen inches. More than half the number of stations recorded below half an inch, there being no rain at all at 90 stations. Rainfall was over two inches in a few limited areas on the north-eastern slopes of the hills and in the south-western foothills, with four stations just topping the five-inch mark. The highest totals were 5·67 inches at Gilimalay Estate and 5·19 inches at Ratnapura.

Rainfall deficiencies were abnormal and widespread. The deficiency was particularly acute on the north-eastern slopes of the hills, which normally receive about 40 inches of rain in January, with more than one daily fall of over five inches, the actual total at Upper St. Martin's Estate being 4·74 inches and at Hendon Estate 5·05 inches. These amounts were below average by 35·30 and 34·95 inches respectively. Rainfall at the other station in this Group, Lower St .Martin's Estate 4·36 inches, was below normal by 29·89 inches. The monthly total of 4·74 inches at Upper St. Martin's Estate is the lowest on record for January during the last 58 years, while that at Hendon Estate is the lowest since commencement of observations in 1917. Several other stations in this neighbourhood created the lowest record for January last month. Rainfall was below normal over the whole Island, the smallest deficit being 1·07 inches at Ratnapura. Among the principal meterological stations, Batticaloa and Galle, with records going back 75 years in each case, recorded the smallest January totals of 0·17 and 0·11 inch respectively. Diyatalâwa with 0·30 inch had the smallest January total during the 45 years for which observations are available there.

When it is remembered that in December, too, rainfall was appreciably below normal in the north-eastern parts, the cumulative effect of deficiencies during the two consecutive months in these regions could be appreciated. The only day on which there was a fairly widespread distribution of rainfall was the 30th when several stations recorded over two inches, the highest being 3·60 inches at Ratnapura.

Temperatures were above average by day, and appreciably below average by night. The highest recorded shade temperature was 94·3° at Ratnapura on the 30th, while the lowest air temperature was 31·7° at Nuwara Eliya on the 20th. Humidities were below average, and cloud amounts in deficit. Winds were below average strength on the east and south-east coasts, and generally above average elsewhere. The direction of wind was variable.

D. T. E. DASSANAYAKE,
Superintendent, Observatory.

METEOROLOGICAL REPORT, FEBRUARY, 1945.

STATION	TEMPERATURE				HUMIDITY		Amount of Cloud	RAINFALL		
	Mean Maximum	Difference from Average	Mean Minimum	Difference from Average	Day	Night (from Minimum)		Amount	No. of Rainy Days	Difference from Average
	°	°	°	°	%	%		Ins.		Ins.
Agalawatta	90·6	+0·8	70·4	—0·8	79	97	5·6	0·57	6	—
Anuradhapura	88·7	+1·9	69·8	+0·2	69	93	4·8	0·32	3	— 1·40
Badulla	81·5	+2·6	61·4	—2·0	70	91	4·1	1·72	2	— 1·45
Batticaloa	82·7	—0·2	71·9	—2·0	82	95	6·4	0·99	4	— 3.22
Colombo	88·0	+0·9	72·4	+0·2	74	88	5·7	0·43	1	— 2·17
Diyatalawa	78·9	+4·3	55·8	—1·1	59	76	6·0	0·50	4	— 1.87
Galle	84·5	—0·8	74·5	+0·9	79	90	6·0	2·58	7	— 0·71
Hakgala	74·1	+4·1	50·8	—0·3	59	71	6·9	2·07	2	— 2·00
Hambantota	85·3	—0·7	72·8	—0·3	80	90	6·6	1·06	3	— 0·40
Jaffna	85·1	—0·5	72·4	0	76	90	4·9	0·71	5	— 0·75
Kandy	90·0	+3·6	65·4	—1·9	62	89	6·0	0·21	1	— 2·10
Kurunegala	92·8	+3·0	70·0	+0·3	59	90	5·2	0·03	2	— 1·96
Lunuwila	89·7	—0·2	70·9	—0·6	75	95	6·2	0·17	2	— 1·37
Mannar	85·4	—1·0	72·9	—0·9	76	88	5·2	0·46	4	— 1·24
Nuwara Eliya	71·9	+2·3	43·8	—1·3	56	78	7·0	0·53	2	— 1·46
Puttalam	88·2	—0·3	70·3	0	74	93	4·2	0·28	1	— 1·09
Ratnapura	91·6	0	71·6	+0·2	70	93	6·7	4·91	8	— 0·39
Talawakele	78·7	+2·4	53·2	—1·6	58	69	5·4	0·43	1	— 1·54
Trincomalee	82·4	—0·2	74·5	—1·4	79	84	5·6	2·46	5	— 0·19

February does not normally yield much rain, being for most parts of the Island the driest month of the year. Even that little rain was not available this year, with the result that the drought conditions that were prevalent in January became intensified and almost unbearable in February.

For a large portion of the Island, comprising the northern and the eastern parts and the south-western low-country, the accumulated deficits over the three months December-February reached considerable proportions. For example, the north-eastern slopes of the hills which normally receive a fair amount of rain during this season were as much as 50 inches in deficit for the three months ending in February, an unbeaten record for well over 50 years. St. Martins (Upper) and Hendon, which are neighbouring estates in the Nitre Cave area, recorded 29·74 and 31·08 inches respectively for the three months, as against averages of 87·77 and 89·54 inches. The abnormality of the present drought may be seen from the fact that the next lowest total for the three months at St. Martins (Upper) with records going back 58 years, was 41·90 inches in 1928–29, as compared with the 29·74 inches this time.

A very large portion of the Island received less than two inches of rain during February. Amounts over two inches were recorded in parts of the south-west and on the eastern slopes of the Uva hills, the highest being 7·54 inches at Udugama and 6·96 inches at Morawaka. Deficits were largest on the north-eastern slopes of the hills, and ranged from 5 to 10 inches, the greatest being 9·16 inches at Hendon Estate. There were a few isolated excesses scattered in the southern parts.

As in January, there was only one day on which there was a wide distribution of rainfall, the 23rd. A large number of stations had their only rain on this day, many individual falls exceeding two inches. The highest was 5·40 inches at Udugama, which was also the only fall of five inches or over for the whole month.

Temperatures were chiefly above average by day, and below average by night. The highest recorded shade temperature was 97·8° at Kurunegala on the 25th, while the lowest air temperature was 35·5° at Nuwara Eliya on the 6th. Humidities were distributed on either side of average, and cloud amounts were in excess. Winds were again below average strength on the east and south-east coasts, and above average elsewhere, the direction being generally variable.

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METEOROLOGICAL REPORT, MARCH, 1945

STATION	TEMPERATURE				HUMIDITY		Amount of Cloud	RAINFALL		
	Mean Maximum	Difference from Average	Mean Minimum	Difference from Average	Day	Night (from Minimum)		Amount	No. of Rainy Days	Difference from Average
	°	°	°	°	%	%		Ins.		Ins.
Agalawatta	90·0	+0·1	71·2	—1·0	84	98	5·1	16·77	15	—
Anuradhapura	91·4	+0·5	70·8	—0·8	68	93	4·4	4·42	7	+ 0·27
Badulla	81·9	—0·3	63·3	—1·1	74	94	5·5	8·11	15	+ 3·06
Batticaloa	84·2	—1·2	73·6	—1·5	84	95	4·8	9·15	13	+ 5·68
Colombo	88·4	+0·6	73·9	—0·1	76	90	4·6	8·31	13	+ 3·65
Diyatalawa	76·8	—0·4	57·6	—0·5	71	85	5·0	5·44	17	+ 0·55
Galle	85·5	—0·8	74·8	—0·3	80	90	4·8	8·98	10	+ 3·67
Hakgala	72·4	—0·8	51·9	+0·1	73	84	6·6	5·89	16	— 0.43
Hambantota	86·0	—0·8	73·8	—0·4	82	90	4·4	3·39	10	0
Jaffna	88·2	—0·3	75·5	—0·3	70	86	2·8	3·69	6	+ 2·11
Kandy	90·7	+2·4	68·1	—0·4	65	90	4·5	1·89	9	— 3·95
Kurunegala	93·9	+1·4	71·6	—0·4	60	90	4·4	2·43	8	— 3·85
Lunuwila	90·5	+0·8	73·1	—0·2	75	95	4·8	6·85	12	+ 1·54
Mannar	89·8	+0·4	74·3	—0·9	75	90	2·8	2·76	7	+ 0·92
Nuwara Eliya	70·8	0	45·7	—0·5	69	82	5·2	4·29	16	+ 0·20
Puttalam	90·6	+0·9	72·7	—0·2	73	90	4·0	2·14	9	— 0·94
Ratnapura	90·8	—1·0	72·3	—0·3	74	93	6·4	9·64	16	— 0·74
Talawakele	78·3	+0·7	54·9	—0·4	68	84	4·8	3·18	11	— 1·44
Trincomalee	84·8	—0·6	75·9	—0·6	79	86	4·2	4·14	11	+ 1·84

After two months of drought the rainfall in March was appreciably above normal over a large portion of the Island. Larger excesses, of the order of 5–10 inches, were found on the east side and in parts of the south-western low country. Outstanding excesses were 10·13 inches at Kobonella estate, and 9·90 inches at Dompe.

Rainfall was below normal over a strip running roughly north-west from Hambantota to Puttalam, and including the south-western hill country. The largest deficits were 8·27 inches at Hambegamuwa, 7·58 inches at West Haputale estate and 6·26 inches at Padupola.

Heaviest rainfall occurred on the north-eastern slopes of the hills and in the south-western low-country. largest totals being 21·20 inches at Opata, 18·41 inches at Kobonella estate and 18·35 inches at Udahena estate. Several other stations received over 15 inches for the month. In the northern and north-western parts, in the central parts of the hill country and in the neighbourhood of Hambantota, rainfall was generally below five inches.

There are 13 daily falls of 5 inches or over during March, nearly all of them occurring on the 30th or 31st The highest was 8·40 inches at Udugama on the 30th.

Rainfall was generally confined to the two periods 6th to 14th and 26th to 31st. A large part of the rain experienced was of thunderstorm origin.

Temperatures were on the whole about average by day and slightly below average by night. The highest recorded shade temperature was 98·0° at Kurunegala on the 24th, while the lowest air temperature was 31·6° at Nuwara Eliya on the 1st. Day humidities were above average. Winds were above average strength, the direction being variable.

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